Junos® OS

Provider Backbone Bridging on MX Series Routers

Release
13.1R1

Published: 2013-02-07

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Junos® OS Junos OS Provider Backbone Bridging on MX Series Routers
Release 13.1R1

Revision History
February 2013—Junos OS 13.1R1

The information in this document is current as of the date on the title page.

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PART 1

Overview

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- Class of Service Overview on page 9
- Connectivity Fault Management Overview on page 13

CHAPTER 1

Provider Backbone Bridging Overview

This chapter discusses the following topics:

- Understanding Provider Backbone Bridging on MX Series Routers on page 3
- Understanding How Interface Sets Work with E-LINE and E-LAN Services on MX Series Routers on page 6
- Understanding PIP and CBP Interfaces on MX Series Routers on page 7

Understanding Provider Backbone Bridging on MX Series Routers

Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability. The Juniper Networks Junos OS implementation of PBB supports the IEEE 802.1ah standard.

NOTE: **PBB is supported only on MX Series routers with Dense Port Concentrators (DPCs). PBB is not supported on MX Series routers with Modular Port Concentrators (MPCs).**

This topic describes the following concepts regarding PBB on Juniper Networks MX Series routers:

- How PBB Improves on Q-in-Q in Layer 2 Ethernet Switching on page 3
- How PBB Works on MX Series Routers on page 4

How PBB Improves on Q-in-Q in Layer 2 Ethernet Switching

When provider bridges (also known as Q-in-Q) extended Layer 2 Ethernet switching to create a two-level system of customer bridges and provider bridges, the solution adequately supported the needs of enterprise networks, but fell short of service provider network requirements.

The IEEE 802.1ad standard supporting Q-in-Q provides for an additional Q-tag that splits the VLAN plane to create two separate VLAN ID (VID) fields: a customer bridge VLAN ID (C-VID) used by customers and a provider bridge VLAN ID (S-VID) used by service providers. This hierarchical layer allows a packet from a C-VID to travel through the customer VLAN, then “stacks” a tag by adding an additional 802.1q tag for the service provider to facilitate segregated travel through a service provider's VLAN. As the packet leaves the S-VID, the extra tag is removed in the downstream direction.

Provider bridge networks (PBNs) have the following limitations:

- Limited number of service instances—PBNs can support a maximum of 4096 service instances per PBN.
- Potential scaling issue—Service provider switches supporting 802.1ad control their own bridges (S-VIDs), but are also required to learn all customer end-station MAC addresses. As a service provider supports more customers, the increased number of learned MAC addresses doesn't scale according to needs. When the number of entries exceeds the capacity permitted in the forwarding table, the forwarding table overflows and can potentially trigger a broadcast storm in the provider network.
- No clear demarcation between customer and provider networks—Customer networks cannot be cleanly separated from provider networks. A clear demarcation point determines what services are provisioned and how fault and performance management is performed for the services provided.

PBB (also known as MAC-in-MAC) is used by service providers to resolve these problems. PBBNs have the following benefits:

- Imposes no change to the Ethernet switching process in the core bridges.
- Supports Ethernet transparent LAN (E-LAN), Ethernet private line (E-LINE), and Ethernet tree service (E-TREE) connectivity models.
- Separates Ethernet as a service from Ethernet as infrastructure.
- Provides a clear demarcation between the customer and provider domain.
- Learns customer MAC addresses only through the backbone edge bridges (BEBs).
- Supports up to 16 million service instances.
- Achieves additional PBBN scaling and interconnection using hierarchical and peer PBBN features.

PBB duplicates the MAC layer of the customer packet and keeps it separate from the provider domain, creating an infrastructure that is transparent from a customer network. BEBs append their forwarding fields (source address [B-SA], destination address [B-DA] and a backbone VID [B-VID]) with the MAC address and a service identifier (I-SID) at the border. A service provider switch only encapsulates the MAC addresses at the edge, between the customer cloud and the provider cloud on the BEB.

To solve the issue of identifying a customer service instance, a new 24-bit I-SID field is used. I-SIDs enable a PBB to support up to 16 million service instances without any impact to the forwarding fields (B-VID, B-SA, and B-DA).

How PBB Works on MX Series Routers

A provider backbone bridged network (PBBN) is composed of a set of BEBs interconnected by some or all of the S-VLANs supported by a PBN. Each BEB provides interfaces that encapsulate (or verify the encapsulation of) customer frames, thus allowing customer

MAC (C-MAC) addresses and VLANs to be independent of the backbone MAC (B-MAC) addresses and VLANs administered by the PBBN operator. The backbone is segregated into broadcast domains by means of a VLAN identifier (B-VID). A new 24-bit service identifier (I-SID) is defined and used to associate a given customer MAC frame with a provider service instance (also called the service delimiter).

To configure PBB on an MX Series router, configure an I-component routing instance and a B-component routing instance. The B-component is the provider routing instance. Each B-component routing instance contains the B-VLAN bridge domains of a PBBN network that map the backbone service instance tag (I-Tag) to a B-VLAN. The I-component is the customer routing instance. The I-component contains the S-VLAN bridge domains of a PBN network that map to a backbone service instance tag (I-Tag). Each S-VLAN is uniquely mapped to a single ISID (1:1 mapping), or multiple S-VLANs can be mapped to an ISID (N:1 mapping).

Each I-component routing instance must be associated with a **pip** interface, and each B-component routing instance must be associated with a **cbp** interface. These interfaces provide a connection between the customer routing instances (PBN or PBBN I-component) and a provider routing instance (PBBN B-component).

MX Series routers support multiple PBBNs (B-components) on a single router. Each router can support up to 16 PBBNs.

The Junos OS also supports enhanced carrier-level CoS and IEEE 802.1ag connectivity fault management (CFM) for PBB.

To configure PBB, include the **routing-instance** ***instance-name*** statement at the [**edit**] hierarchy level. You must create a routing instance for both the I-component and B-component.

Related Documentation

- Understanding How Interface Sets Work with E-LINE and E-LAN Services on MX Series Routers on page 6
- Understanding PIP and CBP Interfaces on MX Series Routers on page 7
- Understanding Class of Service and PBB for MX Series Routers on page 9
- Understanding Junos COS Components for MX Series Routers on page 10
- Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers on page 13

Understanding How Interface Sets Work with E-LINE and E-LAN Services on MX Series Routers

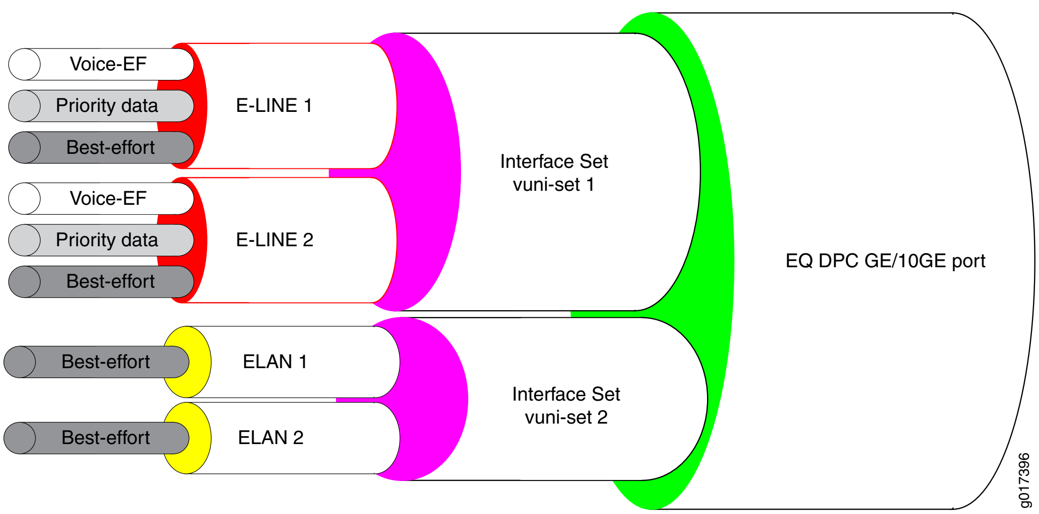
Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability in service provider networks. The Junos OS implementation of PBB supports the IEEE 802.1ah (PBB) standards including the provisioning of Ethernet private line (E-LINE) (point-to-point) and Ethernet transparent LAN (E-LAN) (point-to-multipoint) services.

NOTE: **PBB is supported only on MX Series routers with Dense Port Concentrators (DPCs). PBB is not supported on MX Series routers with Modular Port Concentrators (MPCs).**

To support hierarchical CoS schedulers on Ethernet interfaces and to transport E-LINE and E-LAN traffic over the provider backbone bridged network (PBBN) core, you can configure an existing feature in Junos OS called an *interface set*. An interface set groups a number of logical interfaces into one interface set name.

Figure 1 on page 6 shows the relationship of the forwarding classes in this example. The three types of forwarding classes are **Voice-EF**, **VPN-PR-DATA**, and **INET-BEST-EFFORT**. These forwarding classes are associated with E-LINE 1, E-LINE 2, E-LAN 1, and E-LAN 2. E-LINE 1 and E-LINE 2 are bundled into interface set **vuni-set1**. E-LAN 1 and E-LAN 2 are bundled into interface set **vuni-set2**. The interface set then transports packets through the physical interface. Interface sets provide the same function as a *virtual UNI* in the carrier Ethernet.

Figure 1: Relationship of Forwarding Classes, Services, Interface Sets, and Physical Interface



To configure an interface set, include the **interface-set** statement at the [**edit interfaces**] hierarchy level.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Understanding Provider Backbone Bridging on MX Series Routers on page 3

Understanding PIP and CBP Interfaces on MX Series Routers

The Junos OS supports provider backbone bridging (PBB) described in the IEEE 802.1ah standard. When configuring PBB in carrier Ethernet networks, configure new pseudo-logical interfaces to provide a connection between customer routing instances (PBBN I-component) and provider routing instance (PBBN B-component).

The interfaces **cpb** and **pip** are pseudo-logical interfaces in a PBBN network. A customer backbone port (CBP) is a backbone edge bridge (BEB) port that receives and transmits I-tagged frames for multiple customers, and assigns B-VIDs and translates I-SIDs on the basis of a received I-SID. A provider instance port (pip) logical interface in a PBBN can transmit and receive S-tagged frames and map them to a service identifier (I-SID) while optionally stripping the S-VLAN tag.

Multiple customer routing instances must be associated with a single PBBN provider routing instance. To do this, configure a **cpb** pseudo-logical interface in the B-component of the BEB and a **pip** pseudo-logical interface in each of the I-components of the BEB.

Configure **cpb** and **pip** pseudo-logical interfaces in the same way that you configure other logical interfaces in the Junos OS.

To configure a **cbp** or a **pip** pseudo-logical interface, include the **cbp** or **pip** statement at the [**edit interface** ***interface-name*** **unit** ***logical-unit-number***] hierarchy level, then associate the interface to a routing instance by including the **interface** [**cbp** | **pip**] statement at the [**edit routing-instances** ***instance-name***] hierarchy level.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Understanding Provider Backbone Bridging on MX Series Routers on page 3

CHAPTER 2

Class of Service Overview

This chapter discusses the following topics:

- Understanding Class of Service and PBB for MX Series Routers on page 9
- Understanding Junos COS Components for MX Series Routers on page 10

Understanding Class of Service and PBB for MX Series Routers

Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability. The Junos OS implementation of PBB supports the IEEE 802.1ah standard.

NOTE: PBB is supported only on MX Series routers with Dense Port Concentrators (DPCs). PBB is not supported on MX Series routers with Modular Port Concentrators (MPCs).

Class-of-service (CoS) support for PBB enables information to be mapped and carried across a provider backbone bridge. Service information is mapped and carried across the network using three bits of priority code point (PCP) and one bit of drop eligibility indicator (DEI). The PCP and DEI bits are present in the service VLAN (S-VLAN) and the backbone service instance identifier (ISID).

To provide appropriate QoS treatment inside the MX Series router and transport QoS information across the network, it is important to provide capabilities to classify and rewrite (mark) the PCP+DEI from one tag to another.

Behavior aggregate (BA) classification is used to classify a packet into various forwarding classes (FCs) and packet loss priorities (PLPs) based on certain fields of the packet. A VLAN-tagged logical interface can be configured to classify packets based on the PCP and DEI bits using the existing IEEE 802.1p (only PCP) or IEEE 802.1ad (PCP and DEI) classifier.

To classify packets for a VLAN-tagged logical interface based only on the PCP bits, include the **ieee-802.1** statement at the [**edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers**] hierarchy level. To classify packets based on both PCP and DEI bits, include the **ieee-802.1ad** statement at the same hierarchy level.

A rewrite rule sets the appropriate CoS bits in the outgoing packet, thus allowing the next downstream device to classify the packet into the appropriate service group. A VLAN-tagged logical interface can be configured to rewrite the PCP and DEI classifier of outgoing packets based on the forwarding class and the loss priority using IEEE 802.1p (PCP) or IEEE 802.1ad (PCP and DEI) rewrite rules.

To rewrite packets for a VLAN-tagged logical interface using the existing IEEE 802.1p (PCP) rewrite rules, include the **ieee-802.1** statement at the [**edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules**] hierarchy level. To classify packets based on the IEEE 802.1ad (PCP and DEI) rewrite rules, include the **ieee-802.1ad** statement at the same hierarchy level.

To further support CoS for PBB, new ISID and DEI terms are available when configuring firewall filters. Include terms at the [**edit firewall family bridge filter *filter-name* term *term-name***] hierarchy level.

Related Documentation

- Understanding Junos COS Components for MX Series Routers on page 10
- Understanding Bridging and VLANs on EX Series Switches
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

Understanding Junos COS Components for MX Series Routers

This topic describes the JUNOS class-of-service (CoS) components for Juniper Networks MX Series routers:

- Code-Point Aliases on page 10
- Policers on page 10
- Classifiers on page 11
- Forwarding Classes on page 11
- Drop Profiles on page 11
- Schedulers on page 11
- Rewrite Rules on page 12

Code-Point Aliases

A code-point alias assigns a name to a pattern of code-point bits. You can use this name instead of the bit pattern when you configure other CoS components such as classifiers, drop-profile maps, and rewrite rules.

Policers

Policers limit traffic of a certain class to a specified bandwidth and burst size. Packets exceeding the policer limits can be discarded. You define policers with filters that can be associated with input interfaces.

Classifiers

Packet classification associates incoming packets with a particular CoS servicing level. In JUNOS Software, classifiers associate packets with a forwarding class and loss priority and assign packets to output queues based on the associated forwarding class. JUNOS Software supports two general types of classifiers:

- Behavior aggregate or CoS value traffic classifiers—Examine the CoS value in the packet header. The value in this single field determines the CoS settings applied to the packet. BA classifiers allow you to set the forwarding class and loss priority of a packet based on the Differentiated Services code point (DSCP) value, IP precedence value, and IEEE 802.1p value.
- Multifield traffic classifiers—Examine multiple fields in the packet such as source and destination addresses and source and destination port numbers of the packet. With multifield classifiers, you set the forwarding class and loss priority of a packet based on firewall filter rules.

Forwarding Classes

Forwarding classes group the packets for transmission. Based on forwarding classes, you assign packets to output queues. Forwarding classes affect the forwarding, scheduling, and marking policies applied to packets as they transit a switch. By default, four categories of forwarding classes are defined: best effort, assured forwarding, expedited forwarding, and network control. For MX Series routers, 16 forwarding classes are supported, providing granular classification capability.

Drop Profiles

Drop profile is a mechanism that defines parameters that allow packets to be dropped from the network. Drop profiles define the meanings of the loss priorities. When you configure drop profiles, you are essentially setting the value for queue fullness. The queue fullness represents a percentage of the queue used to store packets in relation to the total amount that has been allocated for that specific queue.

Loss priorities set the priority of dropping a packet. Loss priority affects the scheduling of a packet without affecting the packet's relative ordering. You can use the loss priority setting to identify packets that have experienced congestion. Typically you mark packets exceeding some service level with a high loss priority.

Schedulers

Each switch interface has multiple queues assigned to store packets. The switch determines which queue to service based on a particular method of scheduling. This process often involves determining which type of packet should be transmitted before another. You can define the priority, bandwidth, delay buffer size, and drop profiles to be applied to a particular queue for packet transmission.

A scheduler map associates a specified forwarding class with a scheduler configuration. You can associate up to four user-defined scheduler maps with the interfaces.

Rewrite Rules

A rewrite rule sets the appropriate CoS bits in the outgoing packet, thus allowing the next downstream device to classify the packet into the appropriate service group. Rewriting, or marking, outbound packets is useful when the switch is at the border of a network and must alter the CoS values to meet the policies of the targeted peer.

NOTE: Egress firewall filters can also assign forwarding class and loss priority so that the packets are rewritten based on forwarding class and loss priority.

Related Documentation

- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Understanding Class of Service and PBB for MX Series Routers on page 9

CHAPTER 3

Connectivity Fault Management Overview

This chapter discusses the following topic:

- Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers on page 13

Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers

Connectivity Fault Management (CFM) provides fault isolation and detection over large Layer 2 networks which may span several service provider networks. Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, QoS features, and carrier-class reliability in service provider networks. CFM is used with PBB to support that carrier-class reliability. CFM is used to monitor, isolate and verify the faults in a network. The JUNOS Software implementation of PBB supports the IEEE 802.1ah (PBB) and IEEE 802.1ag (CFM) standards.

NOTE: **PBB is supported only on MX Series routers with Dense Port Concentrators (DPCs). PBB is not supported on MX Series routers with Modular Port Concentrators (MPCs).**

PBB defines an architecture and bridge protocols for connecting multiple provider bridge networks (PBN). A Provider Backbone Bridged Network (PBBN) comprises a set of Backbone Edge Bridges (BEBs) interconnected by some or all of the service VLANs (S-VLANs) supported by a Provider Bridged Network (PBN). S-VLANs are first encapsulated with an I-TAG to uniquely identify the service with PBBN and then are encapsulated within a B-VLAN to be carried over the PBBN core.

CFM uses a set of protocols (Continuity Check, Linktrace and Loopback) for operation, administration and management (OAM) to provide fault isolation and detection. OAM is enabled in a PBN or PBBN by customers, service providers, and network operators in their respective maintenance domains. The OAM operations in PBN and PBBN can coexist and are independent of each other.

In the OAM protocol, the end nodes in maintenance domains are called maintenance end points (MEPs) and initiate OAM processes.

Intermediate nodes respond to these OAM processes and are called maintenance intermediate points (MIPs). MIPs are configured for the I-Component of the BEB. Using MEPs and MIPs, CFM provides end-to-end connectivity in the S-VLAN.

To configure a MEP or a MIP, include the **mep** or **mip** statement at the [**edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association**] hierarchy level.

NOTE: UP MEPs for S-VLANs within an I-component are not supported.

To enable the continuity check protocol to provide fault detection and notification, include the **continuity-check** statement at the [**edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association**] hierarchy level.

The Linktrace protocol provides path discovery and fault verification. Linktrace is enabled by default and can be used whenever a MEP is configured.

The Loopback protocol (modeled on the standard IP ping) is used to perform fault verification and isolation after a fault is detected. Loopback, like Linktrace, is enabled by default and can be used whenever a MEP is configured.

Related Documentation

- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Understanding Provider Backbone Bridging on MX Series Routers on page 3

PART 2

Configuration

- Provider Backbone Bridging Solutions on page 17
- Provider Backbone Bridging Configuration Statements on page 147
- Connectivity Fault Management Configuration Statements on page 175
- CoS Configuration Statements on page 195
- Interface Set Configuration Statements on page 221

CHAPTER 4

Provider Backbone Bridging Solutions

This chapter discusses the following topics:

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers

The IEEE 802.1ah provider backbone bridge (PBB) is a new standard for connecting and interoperating with provider backbone networks. PBB for MX Series routers supports Ethernet private line (E-LINE) and Ethernet transparent LAN (E-LAN) services on the same PBBN network. In an E-LINE service, premises are connected with a point-to-point Ethernet link. E-LAN services are the multipoint version of E-LINE services and are ideal for multi-site companies that require a transparent Layer 2 Virtual LAN.

The MX Series routers provides a solution to deliver these services, including:

- Class of service (CoS)—Reliably deliver the correct amount of bandwidth and quality of service to subscribers.
- Connectivity fault management (CFM)—Monitor, isolate and verify faults in the network.
- Multiple Spanning Tree Protocol (MSTP)—Ensure that services are carried through a loop-free topology for multiple optimization.

This example describes how to configure two E-LAN services and two E-LINE services for one customer on a PBBN, and demonstrates:

- How to configure an MX Series router to load-balance traffic on a per-VLAN basis to optimally utilize links in the PBBN.
- How to configure an MX Series router to carry E-LINE and E-LAN traffic (from the same customer or multiple customers) on the same PBBN.

To configure services in a PBBN, perform these tasks:

- Requirements on page 18
- Overview and Topology on page 18
- Configuring E-LINE and E-LAN Services on BEB1 (Sangiovese) on page 24
- Configuring E-LINE Service on BEB2 (Barbera) on page 32
- Configuring E-LAN Services on BEB3 (Malbec) on page 37
- Configuring E-LINE and E-LAN Services on BEB4 (Cubs) on page 43
- Configuring Routing Instances and Interfaces on ES1 (Pinot Noir) on page 51
- Configuring a Routing Instance and Interfaces on ES3 (Dolcetto) on page 55
- Configuring a Routing Instance and Interfaces on ES4 (Reds) on page 57
- Configuring a Routing Instance and Interfaces on BCB1 (Syrah) on page 61
- Configuring a Routing Instance and Interfaces on BCB2 (Cabernet) on page 65
- Verification on page 69

Requirements

This example uses the following hardware and software components:

- JUNOS Release 10.0 or later for MX Series routers
- 9 MX Series routers in a PBB configuration

Before you configure the routers for PBB and services, be sure you have:

- Installed your MX Series routers.
- Performed the initial router configuration.

Overview and Topology

Figure 2 on page 19 displays the E-LAN service topology for this example. A provider backbone bridge network (PBBN) containing Backbone Core Bridge 1 and 2 (BCB1 and BCB2) provide services for Provider Bridged Networks 1, 2, and 3 (PBN1, PBN2, and PBN3). PBN1 contains Backbone Edge Bridge 1 and 2 (BEB1 and BEB2) and Edge Switches 1 (ES1). PBN2 contains BEB3 and ES3. PBN3 contains BEB4 and ES4. All connecting lines between the PBBN, PBN1, PBN2, and PBN3 represent the E-LAN service.

The active paths shown in the topology are based on the MSTP configuration in the PBBN core network and the resulting paths for all traffic through the network.

Figure 2: Network Topology for E-LAN Service in a Provider Bridged Network

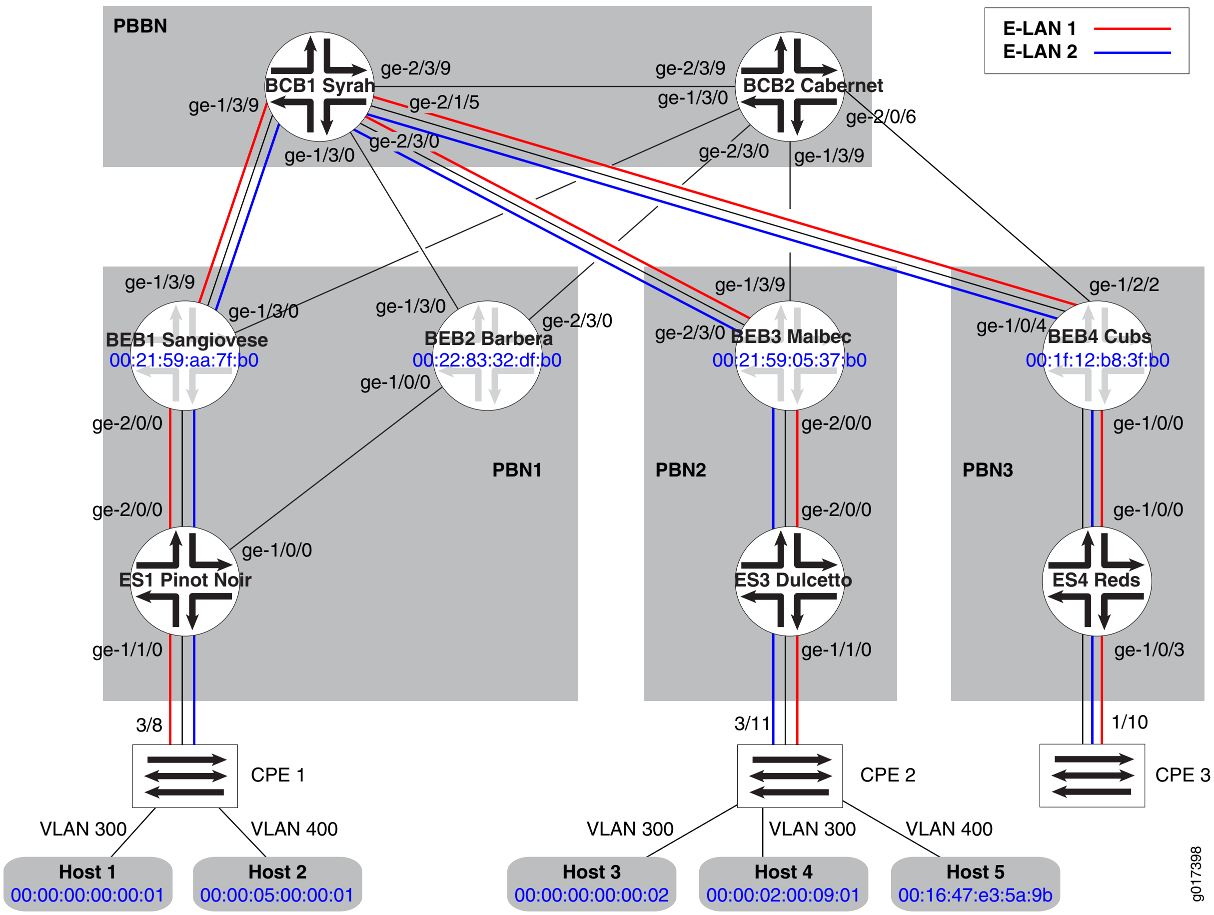


Figure 3 on page 20 displays the E-LINE service topology for this example. The two E-LINEs are shown using the default path created through the MSTP configuration. The active paths shown in the topology are based on the MSTP configuration in the PBBN core network and the resulting paths resulting paths for all traffic through the network. A PBBN provides services for provider bridged networks in BEB1, BEB2, and BEB3.

Figure 3: Network Topology for E-LINE Service in a Provider Bridged Network

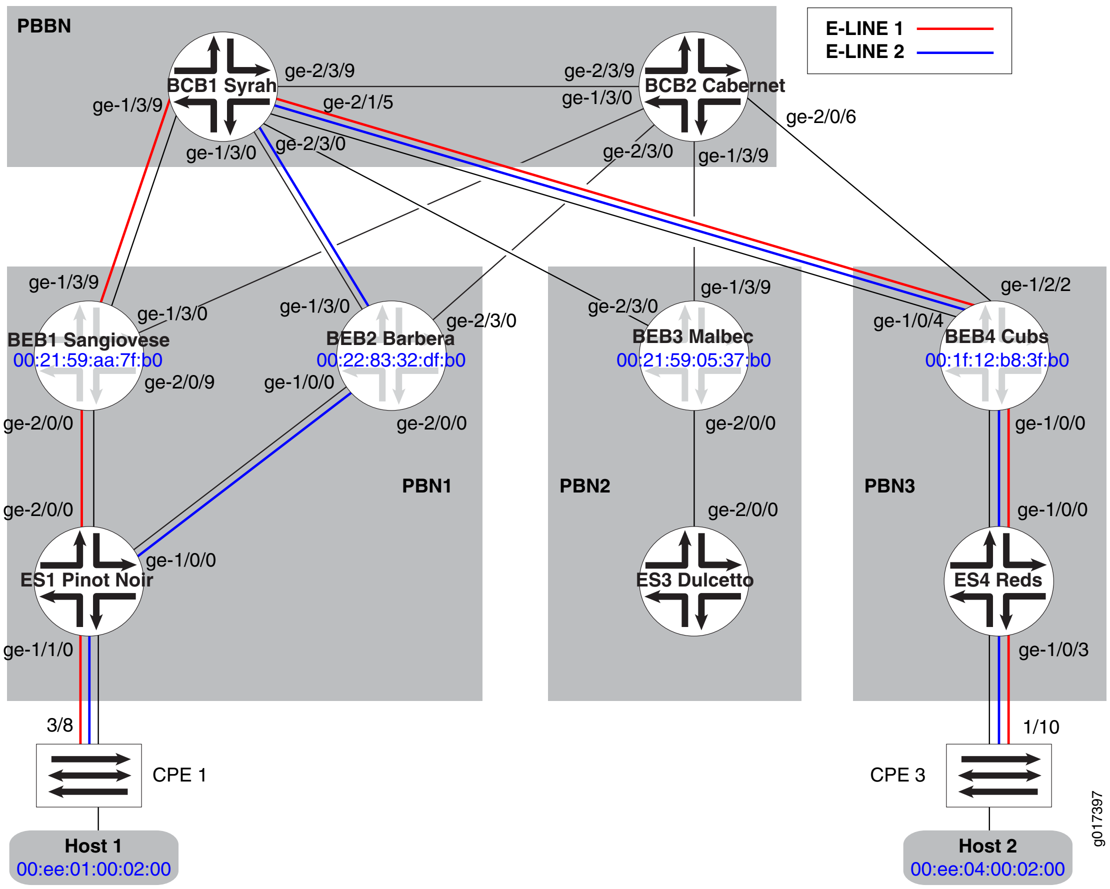


Table 1 on page 20 shows the different properties that will be configured for E-LINE and E-LAN services on the MX Series routers in the topology.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers

Property	Settings
Backbone edge bridges	PBN1 contains: • **BEB1** • **BEB2** PBN2 contains: • **BEB3** PBN3 contains: • **BEB4**
Backbone core bridges	The PBBN contains the following BCBs: • **BCB1** • **BCB2**

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
Edge switches	The edge switches are connected to the following BEBs: • **ES1**–Connected to BEB1 and BEB2. • **ES3**–Connected to BEB3. • **ES4**–Connected to BEB4.
Backbone core bridges	The PBBN contains the following BCBs: • **BCB1** • **BCB2**
BEB1 (Sangiovese) configuration	BEB1 is physically connected to BCB1 and BCB2 in the following manner: • Connected to **BCB1** through interface **ge-1/3/9** • Connected to **BCB2** through interface **ge-1/3/0** The following routing instance is configured for the B-component (PBBN): • The routing instance name is **pbbn-1**. • The pseudo-logical interface is **cbp0.0**. • The logical interfaces **ge-1/3/0.0** and **ge-1/3/9.0** are associated with **pbbn-1**. • MSTP is configured for the routing instance. • The routing instance has the bridging domains **eline-bvlan** and **elan-bvlan**. The following routing instance is configured for the I-component (PBN) for E-LAN services: • The routing instance name is **pbn-1–for-elan**. • The pseudo-logical interface is **pip0.1**. • The logical interfaces **ge-2/0/0.3** and **ge-2/0/0.4** are associated with the routing instance **pbn-1–for-elan**. • The bridging domain is **elan-svlans**. • The service groups are **elan1** and **elan2**. • The peer PBBN routing instance is **pbbn-1**. The following routing instance is configured for the I-component (PBN): • The routing instance name is **pbn-1–for-eline**. • The pseudo-logical interface is **pip0.0**. • The logical interfaces **ge-2/0/0.1** and **ge-2/0/0.2** are associated with the routing instance **pbn-1–for-eline**. • The bridging domains are **bd1** and **eline-svlans**. • The service group is **eline1**. • The peer PBBN routing instance is **pbbn-1**.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
BEB2 (Barbera) configuration	BEB2 is physically connected to BCB1 and BCB2 in the following manner: • Connected to **BCB1** through interface **ge-1/3/0** • Connected to **BCB2** through interface **ge-2/3/0** The following routing instance is configured for the B-component (PBBN): • The routing instance name is **pbbn-1**. • The pseudo-logical interface is **cbp0.0**. • The logical interfaces **ge-1/3/0.0** and **ge-1/3/9.0** are associated with **pbbn-1**. • MSTP is configured for the routing instance. • The routing instance has the bridging domains **eline-bvlan** and **elan-bvlan**. The following routing instance for E-LINE service is configured for the I-component (PBN): • The routing instance name is **pbn–1–for-eline**. • The pseudo-logical interface is **pip0.0**. • The logical interfaces **ge-1/0/0.1** and **ge-1/0/0.2** are associated with the routing instance **pbn–1–for-eline**. • The bridging domains are **bd1** and **eline-svlans**. • The service group is **eline2**. • The peer PBBN routing instance is **pbbn-1**.
BEB3 (Malbec) configuration	BEB3 is physically connected to **BCB2** through interface **ge-1/3/9**. The following routing instance is configured for the B-component (PBBN): • The routing instance name is **pbbn-1**. • The pseudo-logical interface is **cbp0.0**. • The logical interfaces **ge-1/3/9.0** and **ge-2/3/0.0** are associated with **pbbn-1**. • MSTP is configured for the routing instance. • The routing instance has the bridging domain **elan-bvlan**. The following routing instance is configured for the I-component (PBN) for E-LAN services: • The routing instance name is **pbn–2–for-elan**. • The pseudo-logical interface is **pip0.1**. • The logical interfaces **ge-2/0/0.3** and **ge-2/0/0.4** are associated with routing instance **pbn-2for-elan**. • The bridging domain is **elan-svlans**. • The service groups are **elan1** and **elan2**. • The peer PBBN routing instance is **pbbn-1**.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
BEB 4 (Cubs) configuration	BEB4 is physically connected to BCB1 and BCB2 in the following manner: • Connected to **BCB1** through interfaces **ge-2/0/5** and **ge-2/1/5** • Connected to **BCB2** through interfaces **ge-2/0/5** and **ge-2/0/6** The following routing instance is configured for the B-component (PBBN): • The routing instance name is **pbbn-1**. • The pseudo-logical interface is **cbp0.0**. • The logical interfaces **ge-1/0/4.0** and **ge-1/2/2.0** are associated with **pbbn-1**. • MSTP is configured for the routing instance. • The routing instance has the bridging domains **eline-bvlan** and **elan-bvlan**. The following routing instance is configured for the I-component (PBN) for E-LAN services: • The routing instance name is **pbn3–for-elan**. • The pseudo-logical interface is **pip0.1**. • The logical interfaces **ge-1/0/0.3** and **ge-1/0/0.4** are associated with routing instance **pbn–3–for-elan**. • The bridging domain is **elan-svlans**. • The service groups are **elan1** and **elan2**. • The peer PBBN routing instance is **pbbn-1**. The following routing instance is configured for the I-component (PBN): • The routing instance name is **pbn–3–for-eline**. • The pseudo-logical interface is **pip0.0**. • The logical interfaces **ge-2/0/0.1** and **ge-2/0/0.2** are associated with the routing instance **pbn-1–for-eline**. • The bridging domain is **eline-svlans**. • The service groups are **eline1** and **eline2**. • The peer PBBN routing instance is **pbbn-1**.
BCB 1 (Syrah) configuration	BCB1 is physically connected to the BEBs in the following manner: • Connected to **BEB1** through interface **ge-1/3/9** • Connected to **BEB2** through interface **ge-1/3/0** • Connected to **BEB3** through interface **ge-2/3/0** • Connected to **BEB4** through interface **ge-1/0/4** The following routing instance is configured for the PBBN: • The routing instance name is **pbbn-1**. • The logical interfaces **ge-1/3/0.0**, **ge-1/3/9.0**,**ge-2/1/5.0**, **ge-2/3/0.0**, and **ge-2/3/9.0** are associated with **pbbn-1**. • MSTP is configured for the routing instance. • The routing instance has the bridging domains **eline-bvlan** and **elan-bvlan**.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
BCB 2 (Cabernet) configuration	BCB2 is physically connected to the BEBs in the following manner: • Connected to **BEB1** through interface **ge-1/3/0** • Connected to **BEB2** through interface **ge-2/3/0** • Connected to **BEB3** through interface **ge-1/3/9** The following routing instance is configured for the PBBN: • The routing instance name is **pbbn-1**. • The logical interfaces **ge-1/3/0.0**, **ge-1/3/9.0**,**ge-2/0/6.0**, **ge-2/3/0.0**, and **ge-2/3/9.0** are associated with **pbbn-1**. • MSTP is configured for the routing instance. • The routing instance has the bridging domains **eline-bvlan** and **elan-bvlan**.
ES1 (Pinot Noir) configuration ES3 (Dolcetto) configuration ES4 (Reds) configuration	ES1, ES3, and ES4 are physically connected to the BEBs in the following manner: • **ES1** is connected to BEB1 through interface **ge-2/0/0** and BEB2 through interface **ge-1/0/0** • **ES3** is connected to BEB3 through interface **ge-2/0/0** • **ES4** is connected to BEB4 through interface **ge-1/0/0**

To configure services, configure separate routing instances for the PBBN (B-component) and PBN (I-component) on the BEB1, BEB2, BEB3, and BEB4. BCB1 and BCB2 require only a routing instance for the B-component. ES1, ES2, ES3, and ES4 require a routing instance, but not for the B-component.

Multiple Spanning Tree Protocol (MSTP) is configured to provide fast failover and load-balancing benefits to VLANs in the PBBN.

Configuring E-LINE and E-LAN Services on BEB1 (Sangiovese)

Table 2 on page 24 contains the services configured for BEB1 as well as the correlating service virtual local area networks (S-VLANs), service identifiers (I-SIDs), and backbone virtual local area networks (B-VLANs).

Table 2: BEB1 Mapping

Service	S-VLAN	I-SID	B-VLAN
elan1	1300	10300	3350
elan2	1400	10400	3350
eline1	2100	10100	3150

To configure E-LINE and E-LAN services on the MX Series router BEB1 in a PBBN, perform these tasks:

- Configuring a Routing Instance for E-LINE Services on BEB1 on page 25
- Configuring a PBN Routing Instance for E-LAN Services on BEB1 on page 26
- Configuring a PBBN Routing Instance on BEB1 on page 28
- Configuring the Interfaces on BEB1 on page 29

Configuring a Routing Instance for E-LINE Services on BEB1

CLI Quick Configuration

To quickly configure the PBN (I-component) routing instance for E-LINE services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-1-for-eline instance-type virtual-switch
set routing-instances pbn-1-for-eline interface ge-2/0/0.1
set routing-instances pbn-1-for-eline interface pip0.0
set routing-instances pbn-1-for-eline bridge-domains bd1 vlan-id 10
set routing-instances pbn-1-for-eline bridge-domains eline-svlans vlan-id-list 2100
set routing-instances pbn-1-for-eline pbb-options peer-instance pbbn-1
set routing-instances pbn-1-for-eline service-groups eline1 service-type eline
set routing-instances pbn-1-for-eline service-groups eline1 pbb-service-options isid 10100 interface
ge-2/0/0.1
```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LINE service:

1. Configure the PBN routing instance **pbn-1–for-eline** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb1# set pbn-1-for-eline instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBN routing instance:

   ```
   [edit routing-instances]
   user@beb1# set pbn-1-for-eline interface ge-2/0/0.1
   ```
3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

   ```
   [edit routing-instances]
   user@beb1# set pbn-1-for-eline interface pip0.0
   ```
4. Configure the provider bridge domain **bd1** and **eline-svlans** for E-LINE services:

   ```
   [edit routing-instances]
   user@beb1# set pbn-1-for-eline bridge-domains bd1 vlan-id 10
   user@beb1# set pbn-1-for-eline bridge-domains eline-svlans vlan-id-list 2100
   ```
5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

   ```
   [edit routing-instances]
   user@beb1# set pbn-1-for-eline pbb-options peer-instance pbbn-1
   ```
6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **eline1** and **eline2** are configured for **eline** service):

   ```
   [edit routing-instances ]
   user@beb1# set pbn-1-for-eline service-groups eline1 service-type eline
   user@beb1# set pbn-1-for-eline service-groups eline1 pbb-service-options isid 10100 interface
   ge-2/0/0.1
   ```

Results Check the results of the configuration:

```
user@beb1> show configuration
routing-instances {
   pbn-1-for-eline {
      instance-type virtual-switch;
      interface ge-2/0/0.1;
      interface pip0.0;
      bridge-domains {
         bd1 {
            vlan-id 10;
         }
         eline-svlans {
            vlan-id-list [ 2100 ];
         }
      }
      pbb-options {
         peer-instance pbbn-1;
      }
      service-groups {
         eline1 {
            service-type eline;
            pbb-service-options {
               isid 10100 interface ge-2/0/0.1;
            }
         }
      }
   }
}
```

Configuring a PBN Routing Instance for E-LAN Services on BEB1

CLI Quick Configuration To quickly configure a PBN (I-component) routing instance for E-LAN services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-1-for-elan instance-type virtual-switch
set routing-instances pbn-1-for-elan interface ge-2/0/0.3
set routing-instances pbn-1-for-elan interface ge-2/0/0.4
set routing-instances pbn-1-for-elan interface pip0.1
set routing-instances pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1300
set routing-instances pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1400
set routing-instances pbn-1-for-elan pbb-options peer-instance pbbn-1
set routing-instances pbn-1-for-elan service-groups elan1 service-type elan
set routing-instances pbn-1-for-elan service-groups elan1 pbb-service-options isid 10300
vlan-id-list 1300
set routing-instances pbn-1-for-elan service-groups elan2 service-type elan
set routing-instances pbn-1-for-elan service-groups elan2 pbb-service-options isid 10400
vlan-id-list 1400
```

Step-by-Step Procedure To configure the PBN (I-component) routing instance for E-LAN service:

1. Configure the PBN routing instance **pbn–1–for-elan** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb1# set pbn-1-for-elan instance-type virtual-switch
```


2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb1# set pbn-1-for-elan interface ge-2/0/0.3
user@beb1# set pbn-1-for-elan interface ge-2/0/0.4
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb1# set pbn-1-for-elan interface pip0.1
```

4. Configure the provider bridge domain **elan-svlans** for E-LAN services:

```
[edit routing-instances]
user@beb1# set pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1300
user@beb1# set pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1400
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

```
[edit routing-instances]
user@beb1# set pbn-1-for-elan pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **elan1** and **elan2** are configured for **elan** service):

```
[edit routing-instances ]
user@beb1# set pbn-1-for-elan service-groups elan1 service-type elan
user@beb1# set pbn-1-for-elan service-groups elan1 pbb-service-options isid 10300
vlan-id-list 1300
user@beb1# set pbn-1-for-elan service-groups elan2 service-type elan
user@beb1# set pbn-1-for-elan service-groups elan2 pbb-service-options isid 10400
vlan-id-list 1400
```

Results Check the results of the configuration:

```
user@beb1> show configuration
routing-instances {
  pbn-1-for-elan {
    instance-type virtual-switch;
    interface ge-2/0/0.3;
    interface ge-2/0/0.4;
    interface pip0.1;
    bridge-domains {
      elan-svlans {
        vlan-id-list [ 1300 1400 ];
      }
    }
    pbb-options {
      peer-instance pbbn-1;
    }
    service-groups {
      elan1 {
        service-type elan;
        pbb-service-options {
          isid 10300 vlan-id-list 1300;
        }
      }
      elan2 {
        service-type elan;
        pbb-service-options {
```

```
                isid 10400 vlan-id-list 1400;
              }
            }
          }
        }
      }
```

Configuring a PBBN Routing Instance on BEB1

CLI Quick Configuration

To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10300
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10400
set routing instances pbbn-1 pbb-options vlan-id 3150 isid-list 10100
```

Step-by-Step Procedure

To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb1# set pbbn-1 instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBBN routing instance:

   ```
   [edit routing-instances]
   user@beb1# set pbbn-1 interface ge-1/3/0.0
   user@beb1# set pbbn-1 interface ge-1/3/9.0
   ```
3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

   ```
   [edit routing-instances]
   user@beb1# set pbbn-1 interface cbp0.0
   ```
4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

   ```
   [edit routing-instances]
   user@beb1# set pbbn-1 protocols mstp configuration-name pbbn-1
   user@beb1# set pbbn-1 protocols mstp interface ge-1/3/0
   user@beb1# set pbbn-1 protocols mstp interface ge-1/3/9
   ```
5. Configure the provider bridge domains **elan-bvlan** and **eline-bvlan** for E-LINE and E-LAN services:

   ```
   [edit routing-instances]
   user@beb1# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
   ```
6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

   ```
   [edit routing-instances]
   ```

```
user@beb1# set pbbn-1 pbb-options vlan-id 3350 isid-list 10300
user@beb1# set pbbn-1 pbb-options vlan-id 3350 isid-list 10400
user@beb1# set pbbn-1 pbb-options vlan-id 3150 isid-list 10100
```

Results Check the results of the configuration:

```
user@beb1> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-1/3/9.0;
    interface cbp0.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        interface ge-1/3/0;
        interface ge-1/3/9;
      }
    }
    bridge-domains {
      elan-bvlan {
        vlan-id 3350;
      }
      eline-bvlan {
        vlan-id 3150;
        bridge-options {
        }
      }
    }
    pbb-options {
      vlan-id 3350 isid-list [ 10300 10400 ];
      vlan-id 3150 isid-list [ 10100 ];
    }
  }
}
```

Configuring the Interfaces on BEB1

CLI Quick Configuration To quickly configure the interfaces on BEB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/3/0 description "Connected to BCB2 cabernet ge-1/3/0"
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/3/9 description "Connected to BCB1 syrah ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/0/0 description "Connected to pinotnoir ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 1 family bridge vlan-id-list 2100
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge vlan-id-list 1300
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge vlan-id-list 1400
```



```
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 0 family bridge isid-list all-service-groups
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups
```

Step-by-Step Procedure

To configure interfaces on BEB1:

1. Configure interface **ge-1/3/0**:

```
[edit interfaces]
user@beb1# set ge-1/3/0 description "Connected to BCB2 cabernet ge-1/3/0"
user@beb1# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@beb1# set ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

2. Configure interface **ge-1/3/9**:

```
set interfaces
[edit interfaces]
user@beb1# set ge-1/3/9 description "Connected to BCB1 syrah ge-1/3/9"
user@beb1# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@beb1# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

3. Configure interface **ge-2/0/0**:

```
[edit interfaces]
user@beb1# set ge-2/0/0 description "Connected to pinotnoir ge-2/0/0"
user@beb1# set ge-2/0/0 flexible-vlan-tagging
user@beb1# set ge-2/0/0 unit 1 family bridge interface-mode trunk
user@beb1# set ge-2/0/0 unit 1 family bridge vlan-id-list 2100
user@beb1# set ge-2/0/0 unit 3 family bridge interface-mode trunk
user@beb1# set ge-2/0/0 unit 3 family bridge vlan-id-list 1300
user@beb1# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@beb1# set ge-2/0/0 unit 4 family bridge vlan-id-list 1400
```

4. Configure interface **cpb0**:

```
[edit interfaces]
user@beb1# set cbp0 unit 0 family bridge interface-mode trunk
user@beb1# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb1# set cbp0 unit 0 family bridge isid-list all
```

5. Configure interface **pip0**:

```
[edit interfaces]
user@beb1# set pip0 unit 0 family bridge interface-mode trunk
user@beb1# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb1# set pip0 unit 0 family bridge isid-list all-service-groups
user@beb1# set pip0 unit 1 family bridge interface-mode trunk
user@beb1# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb1# set pip0 unit 1 family bridge isid-list all-service-groups
```

Results

Check the results of the configuration:

```
user@beb1> show configuration
interfaces {
  ge-1/0/5 {
    unit 0 {
      family bridge {
        interface-mode trunk;
```

```
                vlan-id-list 3150;
            }
        }
    }
    ge-1/3/0 {
        description "Connected to BCB2 cabernet ge-1/3/0";
        unit 0 {
            family bridge {
                interface-mode trunk;
                vlan-id-list 3000-4000;
            }
        }
    }
    ge-1/3/9 {
        description "Connected to BCB1 syrah ge-1/3/9";
        unit 0 {
            family bridge {
                interface-mode trunk;
                vlan-id-list 3000-4000;
            }
        }
    }
    ge-2/0/0 {
        description "Connected to ES1 pinotnoir ge-2/0/0";
        flexible-vlan-tagging;
        unit 1 {
            family bridge {
                interface-mode trunk;
                vlan-id-list 2100;
            }
        }
        unit 3 {
            family bridge {
                interface-mode trunk;
                vlan-id-list 1300;
            }
        }
        unit 4 {
            family bridge {
                interface-mode trunk;
                vlan-id-list 1400;
            }
        }
    }
    cbp0 {
        unit 0 {
            family bridge {
                interface-mode trunk;
                bridge-domain-type bvlan;
                isid-list all;
            }
        }
    }
    pip0 {
        unit 0 {
            family bridge {
```



```
                interface-mode trunk;
                bridge-domain-type svlan;
                isid-list all-service-groups;
            }
        }
        unit 1 {
            family bridge {
                interface-mode trunk;
                bridge-domain-type svlan;
                isid-list all-service-groups;
            }
        }
    }
}
```

Configuring E-LINE Service on BEB2 (Barbera)

Table 3 on page 32 contains the service configured for BEB2 as well as the correlating S-VLAN, I-SID, and B-VLAN.

Table 3: BEB2 Mapping

Service	S-VLAN	I-SID	B-VLAN
eline2	1200	10200	3150

To configure E-LINE service on the MX Series router BEB2 in a PBBN, perform these tasks:

- Configuring a PBN Routing Instance for E-LINE Services on BEB2 on page 32
- Configuring a PBBN Routing Instance on BEB2 on page 34
- Configuring the Interfaces on BEB2 on page 35

Configuring a PBN Routing Instance for E-LINE Services on BEB2

CLI Quick Configuration

To quickly configure the PBN (I-component) routing instance for E-LINE services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-1-for-eline instance-type virtual-switch
set routing-instances pbn-1-for-eline interface ge-1/0/0.2
set routing-instances pbn-1-for-eline interface pip0.0
set routing-instances pbn-1-for-eline bridge-domains eline-svlans
set routing-instances pbn-1-for-eline bridge-domains eline-svlans vlan-id-list 1200
set routing-instances pbn-1-for-eline pbb-options peer-instance pbbn-1
set routing-instances pbn-1-for-eline service-groups eline2 service-type eline
set routing-instances pbn-1-for-eline service-groups eline2 pbb-service-options isid 10200 interface
ge-1/0/0.2
```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LINE service:

1. Configure the PBN routing instance **pbn–1–for-eline** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb2# set pbn-1-for-eline instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline interface ge-1/0/0.1
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline interface pip0.0
```

4. Configure the provider bridge domain **eline-svlans** for E-LINE services:

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline bridge-domains eline-svlans
user@beb2# set pbn-1-for-eline bridge-domains eline-svlans vlan-id-list 1200
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **eline1** and **eline2** are configured for **eline** service):

```
[edit routing-instances ]
user@beb2# set pbn-1-for-eline service-groups eline2 service-type eline
user@beb2# set pbn-1-for-eline service-groups eline2 pbb-service-options isid 10200
interface ge-1/0/0.2
```

Results Check the results of the configuration:

```
user@beb2> show configuration
routing-instances {
  pbn-1-for-eline {
    instance-type virtual-switch;
    interface ge-1/0/0.2;
    interface pip0.0;
    bridge-domains {
      eline-svlans {
        vlan-id-list [ 1200 ];
      }
    }
    pbb-options {
      peer-instance pbbn-1;
    }
    service-groups {
      eline2 {
        service-type eline;
        pbb-service-options {
          isid 10200 interface ge-1/0/0.2;
        }
      }
    }
  }
}
```

Configuring a PBBN Routing Instance on BEB2

CLI Quick Configuration

To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id 3150
set routing instances pbbn-1 pbb-options vlan-id 3150 isid-list 10200
```

Step-by-Step Procedure

To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb2# set pbbn-1 instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBBN routing instance:

   ```
   [edit routing-instances]
   user@beb2# set pbbn-1 interface ge-1/3/0.0
   user@beb2# set pbbn-1 interface ge-2/3/0.0
   ```
3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

   ```
   [edit routing-instances]
   user@beb2# set pbbn-1 interface cbp0.0
   ```
4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

   ```
   [edit routing-instances]
   user@beb2# set pbbn-1 protocols mstp configuration-name pbbn-1
   user@beb2# set pbbn-1 protocols mstp interface ge-1/3/0
   user@beb2# set pbbn-1 protocols mstp interface ge-2/3/0
   ```
5. Configure the provider bridge domain **eline-bvlan** for E-LINE services:

   ```
   [edit routing-instances]
   user@beb2# set pbbn-1 bridge-domains eline-bvlan vlan-id 3150
   ```
6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

   ```
   [edit routing-instances]
   user@beb2# set pbbn-1 pbb-options vlan-id 3150 isid-list 10200
   ```

Results

Check the results of the configuration:

```
user@beb2> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-2/3/0.0;
```

```
            interface cbp0.0;
            protocols {
                mstp {
                    configuration-name pbbn-1;
                    interface ge-1/3/0;
                    interface ge-2/3/0;
                }
            }
            bridge-domains {
                eline-bvlan {
                    vlan-id 3150;
                    bridge-options {
                }
            }
            pbb-options {
                vlan-id 3150 isid-list [ 10200 ];
            }
        }
    }
```

Configuring the Interfaces on BEB2

CLI Quick Configuration

To quickly configure the interfaces on BEB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/0/0 description "Connected to ES1 pinotnoir ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge vlan-id-list 1200
set interfaces ge-1/3/0 description "Connected to BCB1 syrah ge-1/3/0"
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 3 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/0 description "Connected to BCB2 cabernet ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 0 family bridge isid-list all-service-groups
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups
```

Step-by-Step Procedure

To configure interfaces on BEB2:

1. Configure interface **ge-1/0/0**:

```
[edit interfaces]
user@beb2# set ge-1/0/0 description "Connected to ES1 pinotnoir ge-1/0/0"
user@beb2# set ge-1/0/0 flexible-vlan-tagging
user@beb2# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@beb2# set ge-1/0/0 unit 2 family bridge vlan-id-list 1200
```

2. Configure interface **ge-1/3/0**:

```
[edit interfaces]
user@beb2# set ge-1/3/0 description "Connected to BCB1 syrah ge-1/3/0"
```

```
user@beb2# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@beb2# set ge-1/3/0 unit 3 family bridge vlan-id-list 3000-4000
```

3. Configure interface **ge-2/3/0**:

```
[edit interfaces]
user@beb2# set ge-2/3/0 description "Connected to BCB2 cabernet ge-2/3/0"
user@beb2# set ge-2/3/0 unit 0 family bridge interface-mode trunk
user@beb2# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

4. Configure interface **cpb0**:

```
[edit interfaces]
user@beb2# set cbp0 unit 0 family bridge interface-mode trunk
user@beb2# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb2# set cbp0 unit 0 family bridge isid-list all
```

5. Configure interface **pip0**:

```
[edit interfaces]
user@beb2# set pip0 unit 0 family bridge interface-mode trunk
user@beb2# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb2# set pip0 unit 0 family bridge isid-list all-service-groups
user@beb2# set pip0 unit 1 family bridge interface-mode trunk
user@beb2# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb2# set pip0 unit 1 family bridge isid-list all-service-groups
```

Results Check the results of the configuration:

```
user@beb2> show configuration
interfaces {
  ge-1/0/0 {
    description "Connected to ES1 pinotnoir ge-1/0/0";
    flexible-vlan-tagging;
    unit 2 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1200;
      }
    }
  }
  ge-1/3/0 {
    description "Connected to CS1 syrah ge-1/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/0 {
    description "Connected to CS2 cabernet ge-2/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  cbp0 {
    unit 0 {
```



```
            family bridge {
                interface-mode trunk;
                bridge-domain-type bvlan;
                isid-list all;
            }
        }
    }
    pip0 {
        unit 0 {
            family bridge {
                interface-mode trunk;
                bridge-domain-type svlan;
                isid-list all-service-groups;
            }
        }
        unit 1 {
            family bridge {
                interface-mode trunk;
                bridge-domain-type svlan;
                isid-list all-service-groups;
            }
        }
    }
}
```

Configuring E-LAN Services on BEB3 (Malbec)

Table 4 on page 37 contains the services configured for BEB3 as well as the correlating S-VLANs, I-SIDs, and B-VLANs.

Table 4: BEB2 Mapping

Service	S-VLAN	I-SID	B-VLAN
elan1	1300	10300	3350
elan2	1400	10400	3350

To configure E-LAN services on the MX Series router BEB3 in a PBBN, perform these tasks:

- Configuring a PBN Routing Instance for E-LAN Services on BEB3 on page 37
- Configuring a PBBN Routing Instance on BEB3 (Malbec) on page 39
- Configuring the Interfaces on BEB3 on page 40

Configuring a PBN Routing Instance for E-LAN Services on BEB3

CLI Quick Configuration

To quickly configure a PBN (I-component) routing instance for E-LAN services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-2-for-elan instance-type virtual-switch
set routing-instances pbn-2-for-elan interface ge-2/0/0.3
set routing-instances pbn-2-for-elan interface ge-2/0/0.4
set routing-instances pbn-2-for-elan interface pip0.1
```

set routing-instances pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1300
set routing-instances pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1400
set routing-instances pbn-2-for-elan pbb-options peer-instance pbbn-1
set routing-instances pbn-2-for-elan service-groups elan1 service-type elan
set routing-instances pbn-2-for-elan service-groups elan1 pbb-service-options isid 10300 vlan-id-list 1300
set routing-instances pbn-2-for-elan service-groups elan2 service-type elan
set routing-instances pbn-2-for-elan service-groups elan2 pbb-service-options isid 10400 vlan-id-list 1400

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LAN service:

1. Configure the PBN routing instance **pbn–2–for-elan** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb3# set pbn-2-for-elan instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBN routing instance:

   ```
   [edit routing-instances]
   user@beb3# set pbn-2-for-elan interface ge-2/0/0.3
   user@beb3# set pbn-2-for-elan interface ge-2/0/0.4
   ```
3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

   ```
   [edit routing-instances]
   user@beb3# set pbn-2-for-elan interface pip0.1
   ```
4. Configure the provider bridge domain **elan-svlans** for E-LAN services:

   ```
   [edit routing-instances]
   user@beb3# set pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1300
   user@beb3# set pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1400
   ```
5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

   ```
   [edit routing-instances]
   user@beb3# set pbn-2-for-elan pbb-options peer-instance pbbn-1
   ```
6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **elan1** and **elan2** are configured for **elan** service):

   ```
   [edit routing-instances ]
   user@beb3# set pbn-2-for-elan service-groups elan1 service-type elan
   user@beb3# set pbn-2-for-elan service-groups elan1 pbb-service-options isid 10300
   vlan-id-list 1300
   user@beb3# set pbn-2-for-elan service-groups elan2 service-type elan
   user@beb3# set pbn-2-for-elan service-groups elan2 pbb-service-options isid 10400
   vlan-id-list 1400
   ```

Results

Check the results of the configuration:

```
user@beb3> show configuration
pbn-2-for-elan {
  instance-type virtual-switch;
  interface ge-2/0/0.3;
  interface ge-2/0/0.4;
  interface pip0.1;
  bridge-domains {
    elan1-svlan {
      vlan-id 1300;
    }
```



```
      elan2-svlan {
        vlan-id 1400;
      }
    }
    pbb-options {
      peer-instance pbbn-1;
    }
    service-groups {
      inactive: elan1 {
        service-type elan;
        pbb-service-options {
          isid 10300 vlan-id-list 1300;
        }
      }
      elan2 {
        service-type elan;
        pbb-service-options {
          isid 10400 vlan-id-list 1400;
        }
      }
    }
  }
}
```

Configuring a PBBN Routing Instance on BEB3 (Malbec)

CLI Quick Configuration

To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10300
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10400
```

Step-by-Step Procedure

To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb3# set pbbn-1 instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBBN routing instance:

   ```
   [edit routing-instances]
   user@beb3# set pbbn-1 interface ge-1/3/9.0
   user@beb3# set pbbn-1 interface ge-2/3/0.0
   ```
3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

   ```
   [edit routing-instances]
   user@beb3# set pbbn-1 interface cbp0.0
   ```

4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

```
[edit routing-instances]
user@beb3# set pbbn-1 protocols mstp configuration-name pbbn-1
user@beb3# set pbbn-1 protocols mstp interface ge-1/3/9
user@beb3# set pbbn-1 protocols mstp interface ge-2/3/0
```

5. Configure the provider bridge domain **elan-bvlan** for E-LAN services:

```
[edit routing-instances]
user@beb3# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
```

6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

```
[edit routing-instances]
user@beb3# set pbbn-1 pbb-options vlan-id 3350 isid-list 10300
user@beb3# set pbbn-1 pbb-options vlan-id 3350 isid-list 10400
```

Results Check the results of the configuration:

```
user@beb3> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/9.0;
    interface ge-2/3/0.0;
    interface cbp0.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        interface ge-1/3/9;
        interface ge-2/3/0;
      }
    }
    bridge-domains {
      elan-bvlan {
        vlan-id 3350;
      }
    }
    pbb-options {
      vlan-id 3350 isid-list [ 10300 10400 ];
    }
  }
```

Configuring the Interfaces on BEB3

CLI Quick Configuration To quickly configure the interfaces on BEB3, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/3/9 description "Connected to BCB2 cabernet ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/0/0 description "Connected to ES3 dolcetto ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge vlan-id-list 1300
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
```



```
set interfaces ge-2/0/0 unit 4 family bridge vlan-id-list 1400
set interfaces ge-2/3/0 description "Connected to BCB1 syrah ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 0 family bridge isid-list all-service-groups
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups
```

Step-by-Step Procedure

To configure interfaces on BEB3:

1. Configure interface **ge-1/3/9**:

```
[edit interfaces]
user@beb3# set ge-1/3/9 description "Connected to CS2 cabernet ge-1/3/9"
user@beb3# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@beb3# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

2. Configure interface **ge-2/0/0**:

```
[edit interfaces]
user@beb3# set ge-2/0/0 description "Connected to ES3 dolcetto ge-2/0/0"
user@beb3# set ge-2/0/0 flexible-vlan-tagging
user@beb3# set ge-2/0/0 unit 3 family bridge interface-mode trunk
user@beb3# set ge-2/0/0 unit 3 family bridge vlan-id-list 1300
user@beb3# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@beb3# set ge-2/0/0 unit 4 family bridge vlan-id-list 1400
```

3. Configure interface **ge-2/3/0**:

```
[edit interfaces]
user@beb3# set ge-2/3/0 description "Connected to BCB1 syrah ge-2/3/0"
user@beb3# set ge-2/3/0 unit 0 family bridge interface-mode trunk
user@beb3# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

4. Configure interface **cpb0**:

```
[edit interfaces]
user@beb3# set cbp0 unit 0 family bridge interface-mode trunk
user@beb3# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb3# set cbp0 unit 0 family bridge isid-list all
```

5. Configure interface **pip0**:

```
[edit interfaces]
user@beb3# set pip0 unit 0 family bridge interface-mode trunk
user@beb3# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb3# set pip0 unit 0 family bridge isid-list all-service-groups
user@beb3# set pip0 unit 1 family bridge interface-mode trunk
user@beb3# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb3# set pip0 unit 1 family bridge isid-list all-service-groups
```

Results

Check the results of the configuration:

```
user@beb3> show configuration
interfaces {
  ge-1/3/9 {
    description "Connected to BCB2 cabernet ge-1/3/9";
    unit 0 {
```

```
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
ge-2/0/0 {
    description "Connected to ES3 dolcetto ge-2/0/0";
    flexible-vlan-tagging;
    unit 3 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1300;
        }
    }
    unit 4 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1400;
        }
    }
}
ge-2/3/0 {
    description "Connected to BCB1 syrah ge-2/3/0";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
cbp0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type bvlan;
            isid-list all;
        }
    }
}
pip0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
    unit 1 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
}
```

```
}
```

Configuring E-LINE and E-LAN Services on BEB4 (Cubs)

Table 5 on page 43 contains the services configured for BEB4 as well as the correlating S-VLANs, I-SIDs, and B-VLANs.

Table 5: BEB4 Mapping

Service	S-VLAN	I-SID	B-VLAN
eline1	1100 translated to 2100	10100	3150
eline2	1200	10200	3150
elan1	1300	10300	3350
elan2	1400	10400	3350

To configure E-LINE and E-LAN services on the MX Series router BEB4 in a PBBN, perform these tasks:

- Configuring a Routing Instance for E-LINE Services on BEB4 on page 43
- Configuring a PBN Routing Instance for E-LAN Services on BEB4 on page 45
- Configuring a PBBN Routing Instance on BEB4 on page 46
- Configuring the Interfaces on BEB4 on page 48

Configuring a Routing Instance for E-LINE Services on BEB4

CLI Quick Configuration

To quickly configure the PBN (I-component) routing instance for E-LINE services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-3-for-eline instance-type virtual-switch
set routing-instances pbn-3-for-eline interface ge-1/0/0.1
set routing-instances pbn-3-for-eline interface ge-1/0/0.2
set routing-instances pbn-3-for-eline interface pip0.0
set routing-instances pbn-3-for-eline bridge-domains eline-svlans vlan-id-list 1200
set routing-instances pbn-3-for-eline bridge-domains eline-svlans vlan-id-list 2100
set routing-instances pbn-3-for-eline pbb-options peer-instance pbbn-1
set routing-instances pbn-3-for-eline service-groups eline1 service-type eline
set routing-instances pbn-3-for-eline service-groups eline1 pbb-service-options isid 10100 interface
ge-1/0/0.1
set routing-instances pbn-3-for-eline service-groups eline2 service-type eline
set routing-instances pbn-3-for-eline service-groups eline2 pbb-service-options isid 10200
interface ge-1/0/0.2
```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LINE service:

1. Configure the PBN routing instance **pbn3–for-eline** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb4# set pbn-3-for-eline instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline interface ge-1/0/0.1
user@beb4# set pbn-3-for-eline interface ge-1/0/0.2
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline interface pip0.0
```

4. Configure the provider bridge domain **eline-svlans** for E-LINE services:

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline bridge-domains eline-svlans vlan-id-list 1200
user@beb4# set pbn-3-for-eline bridge-domains eline-svlans vlan-id-list 2100
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **eline1** and **eline1** are configured for **eline** service):

```
[edit routing-instances ]
user@beb4# set pbn-3-for-eline service-groups eline1 service-type eline
user@beb4# set pbn-3-for-eline service-groups eline1 pbb-service-options isid 10100
interface ge-1/0/0.1
user@beb1# set pbn-3-for-eline service-groups eline2 service-type eline
user@beb1# set pbn-3-for-eline service-groups eline2 pbb-service-options isid 10200
interface ge-1/0/0.2
```

Results Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  pbn-3-for-eline {
    instance-type virtual-switch;
    interface ge-1/0/0.1;
    interface ge-1/0/0.2;
    interface pip0.0;
    bridge-domains {
      eline-svlans {
        vlan-id-list [ 1200 2100 ];
      }
    }
    pbb-options {
      peer-instance pbbn-1;
    }
    service-groups {
      eline1 {
        service-type eline;
        pbb-service-options {
          isid 10100 interface ge-1/0/0.1;
        }
      }
      eline2 {
        service-type eline;
        pbb-service-options {
          isid 10200 interface ge-1/0/0.2;
        }
```



```
            }
          }
        }
      }
```

Configuring a PBN Routing Instance for E-LAN Services on BEB4

CLI Quick Configuration

To quickly configure a PBN (I-component) routing instance for E-LAN services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-3-for-elan instance-type virtual-switch
set routing-instances pbn-3-for-elan interface ge-1/0/0.3
set routing-instances pbn-3-for-elan interface ge-1/0/0.4
set routing-instances pbn-3-for-elan interface pip0.1
set routing-instances pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1300
set routing-instances pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1400
set routing-instances pbn-3-for-elan pbb-options peer-instance pbbn-1
set routing-instances pbn-3-for-elan service-groups elan1 service-type elan
set routing-instances pbn-3-for-elan service-groups elan1 pbb-service-options isid 10300
vlan-id-list 1300
set routing-instances pbn-3-for-elan service-groups elan2 service-type elan
set routing-instances pbn-3-for-elan service-groups elan2 pbb-service-options isid 10400
vlan-id-list 1400
```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LAN service:

1. Configure the PBN routing instance **pbn3–for-elan** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@beb4# set pbn-3-for-elan instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBN routing instance:

   ```
   [edit routing-instances]
   user@beb4# set pbn-3-for-elan interface ge-1/0/0.3
   user@beb4# set pbn-3-for-elan interface ge-1/0/0.4
   ```
3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

   ```
   [edit routing-instances]
   user@beb4# set pbn-3-for-elan interface pip0.1
   ```
4. Configure the provider bridge domain **elan-svlans** for E-LAN services:

   ```
   [edit routing-instances]
   user@beb4# set pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1300
   user@beb4# set pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1400
   ```
5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

   ```
   [edit routing-instances]
   user@beb4# set pbn-3-for-elan pbb-options peer-instance pbbn-1
   ```
6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **elan1** and **elan2** are configured for **elan** service):

   ```
   [edit routing-instances ]
   user@beb4# set pbn-3-for-elan service-groups elan1 service-type elan
   user@beb4# set pbn-3-for-elan service-groups elan1 pbb-service-options isid 10300
   vlan-id-list 1300
   user@beb4# set pbn-3-for-elan service-groups elan2 service-type elan
   ```

```
user@beb4# set pbn-3-for-elan service-groups elan2 pbb-service-options isid 10400
vlan-id-list 1400
```

Results Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  pbn-3-for-elan {
    instance-type virtual-switch;
    interface ge-1/0/0.3;
    interface ge-1/0/0.4;
    interface pip0.1;
    bridge-domains {
      elan-svlans {
        vlan-id-list [ 1300 1400 ];
      }
    }
    pbb-options {
      peer-instance pbbn-1;
    }
    service-groups {
      elan1 {
        service-type elan;
        pbb-service-options {
          isid 10300 vlan-id-list 1300;
        }
      }
      elan2 {
        service-type elan;
        pbb-service-options {
          isid 10400 vlan-id-list 1400;
        }
      }
    }
  }
}
```

Configuring a PBBN Routing Instance on BEB4

CLI Quick Configuration To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/0/4.0
set routing-instances pbbn-1 interface ge-1/2/2.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/0/4
set routing-instances pbbn-1 protocols mstp interface ge-1/2/2
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id 3150
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10300
set routing-instances pbbn-1 pbb-options vlan-id 3350 isid-list 10400
set routing-instances pbbn-1 pbb-options vlan-id 3150 isid-list 10100
set routing-instances pbbn-1 pbb-options vlan-id 3150 isid-list 10200
```


Step-by-Step Procedure

To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb4# set pbbn-1 instance-type virtual-switch
```

2. Configure the logical interfaces for the PBBN routing instance:

```
[edit routing-instances]
user@beb4# set pbbn-1 interface ge-1/0/4.0
user@beb4# set pbbn-1 interface ge-1/2/2.0
```

3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb4# set pbbn-1 interface cbp0.0
```

4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

```
[edit routing-instances]
user@beb4# set pbbn-1 protocols mstp configuration-name pbbn-1
user@beb4# set pbbn-1 protocols mstp interface ge-1/0/4
user@beb34# set pbbn-1 protocols mstp interface ge-1/2/2
```

5. Configure the provider bridge domains **elan-bvlan** and **eline-bvlan** for E-LINE and E-LAN services:

```
[edit routing-instances]
user@beb4# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
user@beb4# set pbbn-1 bridge-domains eline-bvlan vlan-id 3150
```

6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

```
[edit routing-instances]
user@beb4# set pbbn-1 pbb-options vlan-id 3350 isid-list 10300
user@beb4# set pbbn-1 pbb-options vlan-id 3350 isid-list 10400
user@beb4# set pbbn-1 pbb-options vlan-id 3150 isid-list 10100
user@beb4# set pbbn-1 pbb-options vlan-id 3150 isid-list 10200
```

Results

Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/0/4.0;
    interface ge-1/2/2.0;
    interface cbp0.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        interface ge-1/0/4;
        interface ge-1/2/2;
      }
    }
    bridge-domains {
      elan-bvlan {
```

```
          vlan-id 3350;
        }
        eline-bvlan {
          vlan-id 3150;
        }
      }
      pbb-options {
        vlan-id 3350 isid-list [ 10300 10400 ];
        vlan-id 3150 isid-list [ 10100 10200 ];
      }
    }
  )
```

Configuring the Interfaces on BEB4

CLI Quick Configuration

To quickly configure the interfaces on BEB4, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/0/0 description "Connected to ES4 Reds ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 encapsulation flexible-ethernet-services
set interfaces ge-1/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 1 family bridge vlan-id-list 2100
set interfaces ge-1/0/0 unit 1 family bridge vlan-rewrite translate 1100 2100
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge vlan-id-list 1200
set interfaces ge-1/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 3 family bridge vlan-id-list 1300
set interfaces ge-1/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 4 family bridge vlan-id-list 1400
set interfaces ge-1/0/4 description "Connected to BCB1 Syrah ge-2/1/5"
set interfaces ge-1/0/4 unit 0 family bridge interface-mode trunk
set interfaces ge-1/0/4 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/2/2 description "Connected to BCB2 Cabernet ge-2/0/6"
set interfaces ge-1/2/2 unit 0 family bridge interface-mode trunk
set interfaces ge-1/2/2 unit 0 family bridge vlan-id-list 3000-4000
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 0 family bridge isid-list all-service-groups
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups
```


Step-by-Step Procedure

To configure interfaces on BEB4:

NOTE: Traffic from ES4 on interface ge-1/0/0 is translated from VLAN 1100 to VLAN 2100 by including the statement **vlan-rewrite**.

1. Configure interface **ge-1/0/0**:

   NOTE: Traffic from ES4 on interface ge-1/0/0 is translated from VLAN 1100 to VLAN 2100 by including the statement **vlan-rewrite**.

   ```
   [edit interfaces]
   user@beb4# set ge-1/0/0 description "Connected to ES4 Reds ge-1/0/0"
   user@beb4# set ge-1/0/0 flexible-vlan-tagging
   user@beb4# set ge-1/0/0 encapsulation flexible-ethernet-services
   user@beb4# set ge-1/0/0 unit 1 family bridge interface-mode trunk
   user@beb4# set ge-1/0/0 unit 1 family bridge vlan-id-list 2100
   user@beb4# set ge-1/0/0 unit 1 family bridge vlan-rewrite translate 1100 2100
   user@beb4# set ge-1/0/0 unit 2 family bridge interface-mode trunk
   user@beb4# set ge-1/0/0 unit 2 family bridge vlan-id-list 1200
   user@beb4# set ge-1/0/0 unit 3 family bridge interface-mode trunk
   user@beb4# set ge-1/0/0 unit 3 family bridge vlan-id-list 1300
   user@beb4# set ge-1/0/0 unit 4 family bridge interface-mode trunk
   user@beb4# set ge-1/0/0 unit 4 family bridge vlan-id-list 1400
   ```
2. Configure interface **ge-1/0/4**:

   ```
   [edit interfaces]
   user@beb4# set ge-1/0/4 description "Connected to BCB1 Syrah ge-2/1/5"
   user@beb4# set ge-1/0/4 unit 0 family bridge interface-mode trunk
   user@beb4# set ge-1/0/4 unit 0 family bridge vlan-id-list 3000-4000
   ```
3. Configure interface **ge-1/2/2**:

   ```
   [edit interfaces]
   user@beb4# set ge-1/2/2 description "Connected to BCB2 Cabernet ge-2/0/6"
   user@beb4# set ge-1/2/2 unit 0 family bridge interface-mode trunk
   user@beb4# set ge-1/2/2 unit 0 family bridge vlan-id-list 3000-4000
   ```
4. Configure interface **cpb0**:

   ```
   [edit interfaces]
   user@beb3# set cbp0 unit 0 family bridge interface-mode trunk
   user@beb3# set cbp0 unit 0 family bridge bridge-domain-type bvlan
   user@beb3# set cbp0 unit 0 family bridge isid-list all
   ```
5. Configure interface **pip0**:

   ```
   [edit interfaces]
   user@beb3# set pip0 unit 0 family bridge interface-mode trunk
   user@beb3# set pip0 unit 0 family bridge bridge-domain-type svlan
   user@beb3# set pip0 unit 0 family bridge isid-list all-service-groups
   user@beb3# set pip0 unit 1 family bridge interface-mode trunk
   user@beb3# set pip0 unit 1 family bridge bridge-domain-type svlan
   user@beb3# set pip0 unit 1 family bridge isid-list all-service-groups
   ```

Results

Check the results of the configuration:

```
user@beb4> show configuration
interfaces {
  ge-1/0/0 {
    description "Connected to ES4 Reds ge-1/0/0";
    flexible-vlan-tagging;
    encapsulation flexible-ethernet-services;
    unit 1 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 2100;
        vlan-rewrite {
          translate 1100 2100;
          # trunk port VLAN translation from vlan1100 to vlan2100
        }
      }
    }
    unit 2 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1200;
      }
    }
    unit 3 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1300;
      }
    }
    unit 4 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1400;
      }
    }
  }
  ge-1/0/4 {
    description "Connected to BCB1 Syrah ge-2/1/5";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-1/2/2 {
    description "Connected to BCB2 Cabernet ge-2/0/6";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  cbp0 {
    unit 0 {
      family bridge {
```



```
                interface-mode trunk;
                bridge-domain-type bvlan;
                isid-list all;
            }
        }
    }
    pip0 {
        unit 0 {
            family bridge {
                interface-mode trunk;
                bridge-domain-type svlan;
                isid-list all-service-groups;
            }
        }
        unit 1 {
            family bridge {
                interface-mode trunk;
                bridge-domain-type svlan;
                isid-list all-service-groups;
            }
        }
    }
}
```

Configuring Routing Instances and Interfaces on ES1 (Pinot Noir)

Table 6 on page 51 contains the information about how the customer VLAN (C-VLAN) is mapped to the services VLAN (S-VLAN) on ES1.

Table 6: ES1 C-VLAN to S-VLAN Mapping

Service	C-VLAN	S-VLAN
E-LINE	100	1100
E-LINE	200	1200
E-LAN	300	1300
E-LAN	400	1400

To configure routing instances and interfaces on the MX Series router called ES1 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for ES1 on page 51
- Configuring the Interfaces on ES1 on page 53

Configuring a Routing Instance for ES1

CLI Quick Configuration

To quickly configure a routing instance for ES1, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances cust-1 instance-type virtual-switch
set routing-instances cust-1 interface ge-1/0/0.1
```

```
set routing-instances cust-1 interface ge-1/0/0.2
set routing-instances cust-1 interface ge-1/0/0.3
set routing-instances cust-1 interface ge-1/0/0.4
set routing-instances cust-1 interface ge-1/1/0.0
set routing-instances cust-1 interface ge-2/0/0.1
set routing-instances cust-1 interface ge-2/0/0.2
set routing-instances cust-1 interface ge-2/0/0.3
set routing-instances cust-1 interface ge-2/0/0.4
set routing-instances cust-1 bridge-domains bds vlan-id-list 100
set routing-instances cust-1 bridge-domains bds vlan-id-list 200
set routing-instances cust-1 bridge-domains bds vlan-id-list 300
set routing-instances cust-1 bridge-domains bds vlan-id-list 400
```

Step-by-Step Procedure

To configure the routing instance for ES1:

1. Configure the routing instance **cust-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@es1# set cust-1instance-type virtual-switch
   ```
2. Configure the logical interfaces for the PBN routing instance:

   ```
   [edit routing-instances]
   user@es1# set cust-1 interface ge-1/0/0.1
   user@es1# set cust-1 interface ge-1/0/0.2
   user@es1# set cust-1 interface ge-1/0/0.3
   user@es1# set cust-1 interface ge-1/0/0.4
   user@es1# set cust-1 interface ge-1/1/0.0
   user@es1# set cust-1 interface ge-2/0/0.1
   user@es1# set cust-1 interface ge-2/0/0.2
   user@es1# set cust-1 interface ge-2/0/0.3
   user@es1# set cust-1 interface ge-2/0/0.4
   ```
3. Configure the bridge domain **bds**:

   ```
   [edit routing-instances]
   user@es1# set cust-1 bridge-domains bds vlan-id-list 100
   user@es1# set cust-1 bridge-domains bds vlan-id-list 200
   user@es1# set cust-1 bridge-domains bds vlan-id-list 300
   user@es1# set cust-1 bridge-domains bds vlan-id-list 400
   ```

Results

Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  cust-1 {
    instance-type virtual-switch;
    interface ge-1/0/0.1;
    interface ge-1/0/0.2;
    interface ge-1/0/0.3;
    interface ge-1/0/0.4;
    interface ge-1/1/0.0;
    interface ge-2/0/0.1;
    interface ge-2/0/0.2;
    interface ge-2/0/0.3;
    interface ge-2/0/0.4;
    bridge-domains {
      bds {
        vlan-id-list [ 100 200 300 400 ];
      }
```

```
      }
    }
  }
```

Configuring the Interfaces on ES1

CLI Quick Configuration

To quickly configure the interfaces on ES1, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/0/0 description "Connected to BEB2 barbera ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 unit 2 vlan-id 1200
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
set interfaces ge-1/1/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 100
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 200
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 300
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 400
set interfaces ge-2/0/0 description "Connected to AS1 sangiovese ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 1 vlan-id 2100
set interfaces ge-2/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 1 family bridge inner-vlan-id-list 100
set interfaces ge-2/0/0 unit 3 vlan-id 1300
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-2/0/0 unit 4 vlan-id 1400
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400
```

Step-by-Step Procedure

To configure interfaces on ES1:

1. Configure interface **ge-1/0/0**:

```
[edit interfaces]
user@es1# set ge-1/0/0 description "Connected to BEB2 barbera ge-1/0/0"
user@es1# set ge-1/0/0 flexible-vlan-tagging
user@es1# set ge-1/0/0 unit 2 vlan-id 1200
user@es1# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@es1# set ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
```

2. Configure interface **ge-1/1/0**:

```
[edit interfaces]
user@es1# set ge-1/1/0 unit 0 family bridge interface-mode trunk
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 100
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 200
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 300
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 400
```

3. Configure interface **ge-2/0/0**:

```
[edit interfaces]
user@es1# set ge-2/0/0 description "Connected to BEB1 sangiovese ge-2/0/0"
user@es1# set ge-2/0/0 flexible-vlan-tagging
user@es1# set ge-2/0/0 unit 1 vlan-id 2100
user@es1# set ge-2/0/0 unit 1 family bridge interface-mode trunk
user@es1# set ge-2/0/0 unit 1 family bridge inner-vlan-id-list 100
user@es1# set ge-2/0/0 unit 3 vlan-id 1300
user@es1# set ge-2/0/0 unit 3 family bridge interface-mode trunk
```

```
user@es1# set ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
user@es1# set ge-2/0/0 unit 4 vlan-id 1400
user@es1# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@es1# set ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400
```

Results Check the results of the configuration:

```
user@es1> show configuration
interfaces {
  ge-1/0/0 {
    description "Connected to BEB2 barbera ge-1/0/0";
    flexible-vlan-tagging;
    unit 2 {
      vlan-id 1200;
      family bridge {
        interface-mode trunk;
        inner-vlan-id-list [ 200 ];
      }
    }
  }
  ge-1/1/0 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list [ 100 200 300 400 ];
      }
    }
  }
  ge-2/0/0 {
    description "Connected to BEB1 sangiovese ge-2/0/0";
    flexible-vlan-tagging;
    unit 1 {
      vlan-id 2100;
      family bridge {
        interface-mode trunk;
        inner-vlan-id-list [ 100 ];
      }
    }
    unit 3 {
      vlan-id 1300;
      family bridge {
        interface-mode trunk;
        inner-vlan-id-list 300;
      }
    }
    unit 4 {
      vlan-id 1400;
      family bridge {
        interface-mode trunk;
        inner-vlan-id-list 400;
      }
    }
  }
}
```


Configuring a Routing Instance and Interfaces on ES3 (Dolcetto)

Table 7 on page 55 contains the information about how the customer VLAN (C-VLAN) is mapped to the services VLAN (S-VLAN) on ES3.

Table 7: ES3 C-VLAN to S-VLAN Mapping

Service	C-VLAN	S-VLAN
E-LAN	300	1300
E-LAN	400	1400

To configure routing instances and interfaces on the MX Series router called ES3 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for ES3 on page 55
- Configuring the Interfaces on ES3 on page 56

Configuring a Routing Instance for ES3

CLI Quick Configuration

To quickly configure a routing instance for ES3, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances cust-1 instance-type virtual-switch
set routing-instances cust-1 interface ge-2/0/0.3
set routing-instances cust-1 interface ge-2/0/0.4
set routing-instances cust-1 interface ge-2/1/0.0
set routing-instances cust-1 bridge-domains bds vlan-id-list 300
set routing-instances cust-1 bridge-domains bds vlan-id-list 400
```

Step-by-Step Procedure

To configure the routing instance for ES3:

1. Configure the routing instance **cust-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@es3# set cust-1instance-type virtual-switch
   ```

2. Configure the logical interfaces for the PBN routing instance:

   ```
   [edit routing-instances]
   user@es3# set cust-1 interface ge-2/0/0.3
   user@es3# set cust-1 interface ge-2/0/0.4
   user@es3# set cust-1 interface ge-2/1/0.0
   ```

3. Configure the bridge domain **bds**:

   ```
   [edit routing-instances]
   user@es3# set cust-1 bridge-domains bds vlan-id-list 300
   user@es3# set cust-1 bridge-domains bds vlan-id-list 400
   ```

Results

Check the results of the configuration:

```
user@es3> show configuration
routing-instances {
  cust-1 {
    instance-type virtual-switch;
```

```
        interface ge-2/0/0.3;
        interface ge-2/0/0.4;
        interface ge-2/1/0.0;
        bridge-domains {
          bds {
            vlan-id-list [ 300 400 ];
          }
        }
      }
    }
```

Configuring the Interfaces on ES3

CLI Quick Configuration

To quickly configure the interfaces on ES3, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/1/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 300
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 400
set interfaces ge-2/0/0 description "Connected to BEB3 malbec ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 3 vlan-id 1300
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-2/0/0 unit 4 vlan-id 1400
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400
```

Step-by-Step Procedure

To configure interfaces on ES3:

1. Configure interface **ge-1/1/0**:

   ```
   [edit interfaces]
   user@es3# set ge-1/1/0 unit 0 family bridge interface-mode trunk
   user@es3# set ge-1/1/0 unit 0 family bridge vlan-id-list 300
   user@es3# set ge-1/1/0 unit 0 family bridge vlan-id-list 400
   ```
2. Configure interface **ge-2/0/0**:

   ```
   [edit interfaces]
   user@es3# set ge-2/0/0 description "Connected to BEB3 malbec ge-2/0/0"
   user@es3# set ge-2/0/0 flexible-vlan-tagging
   user@es3# set ge-2/0/0 unit 3 vlan-id 1300
   user@es3# set ge-2/0/0 unit 3 family bridge interface-mode trunk
   user@es3# set ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
   user@es3# set ge-2/0/0 unit 4 vlan-id 1400
   user@es3# set ge-2/0/0 unit 4 family bridge interface-mode trunk
   user@es3# set ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400
   ```

Results

Check the results of the configuration:

```
user@es3> show configuration
interfaces {
  ge-1/1/0 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list [ 300 400 ];
      }
```



```
        }
      }
      ge-2/0/0 {
        description "Connected to BEB3 malbec ge-2/0/0";
        flexible-vlan-tagging;
        unit 3 {
          vlan-id 1300;
          family bridge {
            interface-mode trunk;
            inner-vlan-id-list 300;
          }
        }
        unit 4 {
          vlan-id 1400;
          family bridge {
            interface-mode trunk;
            inner-vlan-id-list 400;
          }
        }
      }
    }
```

Configuring a Routing Instance and Interfaces on ES4 (Reds)

Table 8 on page 57 contains the information about how the customer VLAN (C-VLAN) is mapped to the services VLAN (S-VLAN) on ES4.

Table 8: ES4 C-VLAN to S-VLAN Mapping

Service	C-VLAN	S-VLAN
E-LINE	100	1100
E-LINE	200	1200
E-LAN	300	1300
E-LAN	400	1400

To configure routing instances and interfaces on the MX Series router called ES4 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for ES4 on page 57
- Configuring the Interfaces on ES4 on page 59

Configuring a Routing Instance for ES4

CLI Quick Configuration

To quickly configure a routing instance for ES4, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances cust-1 instance-type virtual-switch
set routing-instances cust-1 interface ge-1/0/0.1
set routing-instances cust-1 interface ge-1/0/0.2
set routing-instances cust-1 interface ge-1/0/0.3
```

```
set routing-instances cust-1 interface ge-1/0/0.4
set routing-instances cust-1 interface ge-1/0/3.1
set routing-instances cust-1 interface ge-1/0/3.2
set routing-instances cust-1 interface ge-1/0/3.3
set routing-instances cust-1 interface ge-1/0/3.4
set routing-instances cust-1 bridge-domains bds vlan-id-list 100
set routing-instances cust-1 bridge-domains bds vlan-id-list 200
set routing-instances cust-1 bridge-domains bds vlan-id-list 300
set routing-instances cust-1 bridge-domains bds vlan-id-list 400
```

Step-by-Step Procedure

To configure the routing instance for ES4:

1. Configure the routing instance **cust-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@es4# set cust-1instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@es4# set cust-1 interface ge-1/0/0.1
user@es4# set cust-1 interface ge-1/0/0.2
user@es4# set cust-1 interface ge-1/0/0.3
user@es4# set cust-1 interface ge-1/0/0.4
user@es4# set cust-1 interface ge-1/0/3.1
user@es4# set cust-1 interface ge-1/0/3.2
user@es4# set cust-1 interface ge-1/0/3.3
user@es4# set cust-1 interface ge-1/0/3.4
```

3. Configure the bridge domain **bds**:

```
[edit routing-instances]
user@es4# set cust-1 bridge-domains bds vlan-id-list 100
user@es4# set cust-1 bridge-domains bds vlan-id-list 200
user@es4# set cust-1 bridge-domains bds vlan-id-list 300
user@es4# set cust-1 bridge-domains bds vlan-id-list 400
```

Results

Check the results of the configuration:

```
user@es4> show configuration
routing-instances {
  cust-1 {
    instance-type virtual-switch;
    interface ge-1/0/0.1;
    interface ge-1/0/0.2;
    interface ge-1/0/0.3;
    interface ge-1/0/0.4;
    interface ge-1/0/3.1;
    interface ge-1/0/3.2;
    interface ge-1/0/3.3;
    interface ge-1/0/3.4;
    bridge-domains {
      bds {
        vlan-id-list [ 100 200 300 400 ];
      }
    }
  }
}
```

Configuring the Interfaces on ES4

CLI Quick Configuration

To quickly configure the interfaces on ES4, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces interface-set vuni-set1 interface ge-1/0/3 unit 1
set interfaces interface-set vuni-set1 interface ge-1/0/3 unit 3
set interfaces interface-set vuni-set1 interface ge-1/0/3 unit 4
set interfaces interface-set vuni-set2 interface ge-1/0/3 unit 2
set interfaces ge-1/0/0 description "Connected to ES4 Reds ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 unit 1 vlan-id 1100
set interfaces ge-1/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 1 family bridge inner-vlan-id-list 100
set interfaces ge-1/0/0 unit 2 vlan-id 1200
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
set interfaces ge-1/0/0 unit 3 vlan-id 1300
set interfaces ge-1/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-1/0/0 unit 4 vlan-id 1400
set interfaces ge-1/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 4 family bridge inner-vlan-id-list 400
set interfaces ge-1/0/3 flexible-vlan-tagging
set interfaces ge-1/0/3 unit 1 vlan-id 1100
set interfaces ge-1/0/3 unit 1 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 1 family bridge inner-vlan-id-list 100
set interfaces ge-1/0/3 unit 2 vlan-id 1200
set interfaces ge-1/0/3 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 2 family bridge inner-vlan-id-list 200
set interfaces ge-1/0/3 unit 3 vlan-id 1300
set interfaces ge-1/0/3 unit 3 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-1/0/3 unit 4 vlan-id 1400
set interfaces ge-1/0/3 unit 4 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 4 family bridge inner-vlan-id-list 400
```

Step-by-Step Procedure

To configure interfaces on ES4:

1. Configure the interface sets **vuni-set1** and **vuni-set2**:

```
[edit interfaces]
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 1
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 3
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 4
user@es4# set interface-set vuni-set2 interface ge-1/0/3 unit 2
```

2. Configure interface **ge-1/0/0**:

```
[edit interfaces]
user@es4# set ge-1/0/0 description "Connected to BEB4 Cubs ge-1/0/0"
user@es4# set ge-1/0/0 flexible-vlan-tagging
user@es4# set ge-1/0/0 unit 1 vlan-id 1100
user@es4# set ge-1/0/0 unit 1 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 1 family bridge inner-vlan-id-list 100
user@es4# set ge-1/0/0 unit 2 vlan-id 1200
user@es4# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
user@es4# set ge-1/0/0 unit 3 vlan-id 1300
user@es4# set ge-1/0/0 unit 3 family bridge interface-mode trunk
```



```
user@es4# set ge-1/0/0 unit 3 family bridge inner-vlan-id-list 300
user@es4# set ge-1/0/0 unit 4 vlan-id 1400
user@es4# set ge-1/0/0 unit 4 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 4 family bridge inner-vlan-id-list 400
```

3. Configure interface **ge-1/0/3**:

```
[edit interfaces]
user@es4# set ge-1/0/3 description "Connected to Gigabit switch"
user@es4# set ge-1/0/3 flexible-vlan-tagging
user@es4# set ge-1/0/3 unit 1 vlan-id 1100
user@es4# set ge-1/0/3 unit 1 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 1 family bridge inner-vlan-id-list 100
user@es4# set ge-1/0/3 unit 2 vlan-id 1200
user@es4# set ge-1/0/3 unit 2 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 2 family bridge inner-vlan-id-list 200
user@es4# set ge-1/0/3 unit 3 vlan-id 1300
user@es4# set ge-1/0/3 unit 3 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 3 family bridge inner-vlan-id-list 300
user@es4# set ge-1/0/3 unit 4 vlan-id 1400
user@es4# set ge-1/0/3 unit 4 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 4 family bridge inner-vlan-id-list 400
```

Results Check the results of the configuration:

```
user@es4> show configuration
interfaces {
  interface-set vuni-set1 {
    interface ge-1/0/3 {
      unit 1;
      unit 3;
      unit 4;
    }
  }
  interface-set vuni-set2 {
    interface ge-1/0/3 {
      unit 2;
    }
  }
  ge-1/0/0 {
    description "Connected to BEB4 Cubs ge-1/0/0";
    flexible-vlan-tagging;
    # each unit
    unit 1 {
      vlan-id 1100;
      family bridge {
        interface-mode trunk;
        inner-vlan-id-list [ 100 ];
      }
    }
    unit 2 {
      vlan-id 1200;
      family bridge {
        interface-mode trunk;
        inner-vlan-id-list [ 200 ];
      }
    }
    unit 3 {
```



```
            vlan-id 1300;
            family bridge {
                interface-mode trunk;
                inner-vlan-id-list 300;
            }
        }
        unit 4 {
            vlan-id 1400;
            family bridge {
                interface-mode trunk;
                inner-vlan-id-list 400;
            }
        }
    }
    ge-1/0/3 {
        flexible-vlan-tagging;
    # interface-set and port level
        unit 1 {
            vlan-id 1100;
            family bridge {
                interface-mode trunk;
                inner-vlan-id-list 100;
            }
        }
        unit 2 {
            vlan-id 1200;
            family bridge {
                interface-mode trunk;
                inner-vlan-id-list 200;
            }
        }
        unit 3 {
            vlan-id 1300;
            family bridge {
                interface-mode trunk;
                inner-vlan-id-list 300;
            }
        }
        unit 4 {
            vlan-id 1400;
            family bridge {
                interface-mode trunk;
                inner-vlan-id-list 400;
            }
        }
```

Configuring a Routing Instance and Interfaces on BCB1 (Syrah)

To configure routing instances and interfaces on the MX Series router called BCB1 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for BCB1 on page 62
- Configuring the Interfaces on BCB1 on page 63

Configuring a Routing Instance for BCB1

CLI Quick Configuration

To quickly configure a routing instance for BCB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface ge-2/1/5.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface ge-2/3/9.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp bridge-priority 4k
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 protocols mstp interface ge-2/1/5
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 protocols mstp interface ge-2/3/9
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150
```

Step-by-Step Procedure

To configure the routing instance for BCB1:

1. Configure the routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

   ```
   [edit routing-instances]
   user@bcb1# set pbbn-1instance-type virtual-switch
   ```

2. Configure the logical interfaces for the PBN routing instance:

   ```
   [edit routing-instances]
   user@bcb1# set pbbn-1 interface ge-1/3/0.0
   user@bcb1# set pbbn-1 interface ge-1/3/9.0
   user@bcb1# set pbbn-1 interface ge-2/1/5.0
   user@bcb1# set pbbn-1 interface ge-2/3/0.0
   user@bcb1# set pbbn-1 interface ge-2/3/9.0
   ```

3. Configure MSTP:

   ```
   [edit routing-instances]
   user@bcb1# set pbbn-1 protocols mstp configuration-name pbbn-1
   user@bcb1# set pbbn-1 protocols mstp bridge-priority 4k
   user@bcb1# set pbbn-1 protocols mstp interface ge-1/3/0
   user@bcb1# set pbbn-1 protocols mstp interface ge-1/3/9
   user@bcb1# set pbbn-1 protocols mstp interface ge-2/1/5
   user@bcb1# set pbbn-1 protocols mstp interface ge-2/3/0
   user@bcb1# set pbbn-1 protocols mstp interface ge-2/3/9
   ```

4. Configure the bridge domain **bds**:

   ```
   [edit routing-instances]
   user@bcb1# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
   user@bcb1# set pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150
   ```

Results

Check the results of the configuration:

```
user@ebcb1> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
```



```
        interface ge-1/3/0.0;
        interface ge-1/3/9.0;
        interface ge-2/1/5.0;
        interface ge-2/3/0.0;
        interface ge-2/3/9.0;
        protocols {
          mstp {
            configuration-name pbbn-1;
            bridge-priority 4k;
            interface ge-1/3/0;
            interface ge-1/3/9;
            interface ge-2/1/5;
            interface ge-2/3/0;
            interface ge-2/3/9;
          }
        }
        bridge-domains {
          elan-bvlan {
            vlan-id 3350;
          }
          eline-bvlan {
            vlan-id 3150;
          }
        }
      }
    }
```

Configuring the Interfaces on BCB1

CLI Quick Configuration

To quickly configure the interfaces on BCB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
set interfaces ge-1/3/0 enable
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
set interfaces ge-2/1/5 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/9 description "Connected to BCB2 cabernet ge-2/3/9"
set interfaces ge-2/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000
```


Step-by-Step Procedure

To configure interfaces on BCB1:

1. Configure interface **ge-1/3/0**:

```
[edit interfaces]
user@bcb1# set ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
user@bcb1# set ge-1/3/0 enable
user@bcb1# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

2. Configure interface **ge-1/3/9**:

```
set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"
[edit interfaces]
user@bcb1# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

3. Configure interface **ge-2/1/5**:

```
[edit interfaces]
user@bcb1# set ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
user@bcb1# set ge-2/1/5 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
```

4. Configure interface **ge-2/3/0**:

```
[edit interfaces]
user@bcb1# set ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
user@bcb1# set ge-2/3/0 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

5. Configure interface **ge-2/3/9**:

```
[edit interfaces]
user@bcb1# set ge-2/3/9 description "Connected to BCB2 cabernet ge-2/3/9"
user@bcb1# set ge-2/3/9 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

Results

Check the results of the configuration:

```
user@bcb1> show configuration
interfaces {
   ge-1/3/0 {
      description "Connected to BEB2 barbera ge-1/3/0";
      enable;
      unit 0 {
         family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
         }
      }
   }
   ge-1/3/9 {
      description "Connected to BEB1 sangiovese ge-1/3/9";
      unit 0 {
         family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
         }
      }
   }
   ge-2/1/5 {
      description "Connected to BEB4 Cubs ge-1/0/4";
```

```
            unit 0 {
               family bridge {
                  interface-mode trunk;
                  vlan-id-list 3000-4000;
               }
            }
         }
         ge-2/3/0 {
            description "Connected to BEB3 malbec ge-2/3/0";
            unit 0 {
               family bridge {
                  interface-mode trunk;
                  vlan-id-list 3000-4000;
               }
            }
         }
         ge-2/3/9 {
            description "Connected to BCB2 cabernet ge-2/3/9"
            unit 0 {
               family bridge {
                  interface-mode trunk;
                  vlan-id-list 3000-4000;
               }
            }
         }
      }
```

Configuring a Routing Instance and Interfaces on BCB2 (Cabernet)

To configure routing instances and interfaces on the MX Series router called BCB2 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for BCB2 on page 65
- Configuring the Interfaces on BCB2 on page 67

Configuring a Routing Instance for BCB2

CLI Quick Configuration

To quickly configure a routing instance for BCB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface ge-2/1/5.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface ge-2/3/9.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp bridge-priority 4k
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 protocols mstp interface ge-2/1/5
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 protocols mstp interface ge-2/3/9
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150
```


Step-by-Step Procedure

To configure the routing instance for BCB2:

1. Configure the routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@bcb2# set pbbn-1instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@bc21# set pbbn-1 interface ge-1/3/0.0
user@bcb2# set pbbn-1 interface ge-1/3/9.0
user@bcb2# set pbbn-1 interface ge-2/1/5.0
user@bcb2# set pbbn-1 interface ge-2/3/0.0
user@bcb2# set pbbn-1 interface ge-2/3/9.0
```

3. Configure MSTP:

```
[edit routing-instances]
user@bcb2# set pbbn-1 protocols mstp configuration-name pbbn-1
user@bcb2# set pbbn-1 protocols mstp bridge-priority 4k
user@bcb2# set pbbn-1 protocols mstp interface ge-1/3/0
user@bcb2# set pbbn-1 protocols mstp interface ge-1/3/9
user@bcb2# set pbbn-1 protocols mstp interface ge-2/1/5
user@bcb2# set pbbn-1 protocols mstp interface ge-2/3/0
user@bcb2# set pbbn-1 protocols mstp interface ge-2/3/9
```

4. Configure the bridge domain **bds**:

```
[edit routing-instances]
user@bcb2# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
user@bcb2# set pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150
```

Results

Check the results of the configuration:

```
user@bcb2> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-1/3/9.0;
    interface ge-2/0/6.0;
    interface ge-2/3/0.0;
    interface ge-2/3/9.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        bridge-priority 4k;
        interface ge-1/3/0;
        interface ge-1/3/9;
        interface ge-2/0/6;
        interface ge-2/3/0;
        interface ge-2/3/9;
      }
    }
    bridge-domains {
      elan-bvlan {
        vlan-id 3350;
      }
      eline-bvlan {
```

```
            vlan-id-list 3150;
          }
        }
      }
    }
```

Configuring the Interfaces on BCB2

CLI Quick Configuration

To quickly configure the interfaces on BCB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
set interfaces ge-1/3/0 enable
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
set interfaces ge-2/1/5 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/9 description "Connected to BCB1 syrah ge-2/3/9"
set interfaces ge-2/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

Step-by-Step Procedure

To configure interfaces on BCB2:

1. Configure interface **ge-1/3/0**:

   ```
   [edit interfaces]
   user@bcb2# set ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
   user@bcb2# set ge-1/3/0 enable
   user@bcb2# set ge-1/3/0 unit 0 family bridge interface-mode trunk
   user@bcb2# set ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
   ```

2. Configure interface **ge-1/3/9**:

   ```
   set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"
   [edit interfaces]
   user@bcb2# set ge-1/3/9 unit 0 family bridge interface-mode trunk
   user@bcb2# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
   ```

3. Configure interface **ge-2/1/5**:

   ```
   [edit interfaces]
   user@bcb2# set ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
   user@bcb2# set ge-2/1/5 unit 0 family bridge interface-mode trunk
   user@bcb2# set ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
   ```

4. Configure interface **ge-2/3/0**:

   ```
   [edit interfaces]
   user@bcb2# set ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
   user@bcb2# set ge-2/3/0 unit 0 family bridge interface-mode trunk
   user@bcb2# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
   ```

5. Configure interface **ge-2/3/9**:

   ```
   [edit interfaces]
   user@bcb2# set ge-2/3/9 description "Connected to BCB1 syrah ge-2/3/9"
   ```

```
user@bcb2# set ge-2/3/9 unit 0 family bridge interface-mode trunk
user@bcb2# set ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

Results Check the results of the configuration:

```
user@bcb2> show configuration
interfaces {
  ge-1/3/0 {
    description "Connected to BEB1 sangiovese ge-1/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-1/3/9 {
    description "Connected to BEB3 malbec ge-1/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/0/6 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/0 {
    description "Connected to BEB2 barbera ge-2/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/9 {
    description "Connected to BCB1 syrah ge-2/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
}
```


Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying E-LINE and E-LAN Service on BEB1 on page 69
- Verifying E-LINE and E-LAN Service on BEB3 on page 71
- Verifying E-LINE and E-LAN Service on BEB4 on page 73
- Verifying E-LINE and E-LAN Service on BCB1 on page 76
- Verifying E-LINE and E-LAN Service on BCB2 on page 76
- Verifying E-LINE and E-LAN Service on ES1 on page 77
- Verifying E-LINE and E-LAN Service on ES3 on page 78
- Verifying E-LINE and E-LAN Service on ES4 on page 79

Verifying E-LINE and E-LAN Service on BEB1

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB1 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb1> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : elan-bvlan, VLAN-ID : 3350

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN              Provider          S-VLAN  Flags    Backbone
          Routing          Bridging                           Destination
          Instance         Domain                             MAC
10400     pbn-1-for-elan   elan-svlans-vlan-1400 1400 M1,MP   01:1e:86:00:28:a0
10300     pbn-1-for-elan   elan-svlans-vlan-1300 1300 M1,MP   01:1e:86:00:28:3c

Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : eline-bvlan, VLAN-ID : 3150

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN              Provider          S-VLAN  Flags    Backbone
          Routing          Bridging                           Destination
          Instance         Domain                             MAC
10100     pbn-1-for-eline  eline-svlans-vlan-2100 2100 M1,P2P 01:1e:86:00:27:74

user@beb1> show l2-learning provider-instance
PBN Routing Instance: pbn-1-for-elan
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                  S-VLAN   ISID       PBBN            B-VLAN   Flags
Bridging                                 Bridging
Domain                                   Domain
elan-svlans-vlan-1300 1300  10300       elan-bvlan       3350     M1,MP
elan-svlans-vlan-1400 1400  10400       elan-bvlan       3350     M1,MP

PBN Routing Instance: pbn-1-for-eline
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                  S-VLAN   ISID       PBBN            B-VLAN   Flags
Bridging                                 Bridging
Domain                                   Domain
eline-svlans-vlan-2100 2100  10100      eline-bvlan      3150     M1,P2P

user@beb1> show l2-learning remote-backbone-edge-bridge
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : pbbn-1

   RBEB MAC              Time before       Flags
   Address               expiry (SS:MS)
   00:1f:12:b8:3f:b0           :

user@beb1> show bridge mac-table
```



```
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : elan-bvlan, VLAN : 3350
   MAC                  MAC      Logical
   address              flags    interface
   00:1f:12:b8:38:11    D        ge-1/3/9.0
   00:1f:12:b8:3a:99    D        ge-1/3/9.0
   00:21:59:05:37:19    D        ge-1/3/9.0
   00:21:59:aa:74:8d    D        ge-1/3/9.0
   00:22:83:32:ef:22    D        ge-1/3/9.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : eline-bvlan, VLAN : 3150
   MAC                  MAC      Logical
   address              flags    interface
   00:1f:12:b8:38:11    D        ge-1/3/9.0
   00:1f:12:b8:3f:b0    D        ge-1/3/9.0
   00:22:83:32:d8:11    D        ge-1/3/9.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbn-1-for-elan
 Bridging domain : elan-svlans-vlan-1300, ISID : 10300, VLAN : 1300

   MAC                  MAC      Logical                 Remote
   address              flags    interface               MAC address
   00:00:00:00:00:01    D        ge-2/0/0.3
   00:00:00:00:00:02    D        pip0.1                  00:21:59:05:37:b0
   00:00:02:00:09:01    D        pip0.1                  00:21:59:05:37:b0

Routing instance : pbn-1-for-elan
 Bridging domain : elan-svlans-vlan-1400, ISID : 10400, VLAN : 1400

   MAC                  MAC      Logical                 Remote
   address              flags    interface               MAC address
   00:16:47:e3:5a:9b    D        pip0.1                  00:21:59:05:37:b0
   00:00:05:00:00:01    D        ge-2/0/0.4
```

Verifying E-LINE and E-LAN Service on BEB3

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB3 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb3> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : elan-bvlan, VLAN-ID : 3350

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN                Provider          S-VLAN  Flags    Backbone
          Routing            Bridging                           Destination
          Instance           Domain                             MAC
10400     pbn-2-for-elan     elan-svlans-vlan-1400 1400 M1,MP   01:1e:86:00:28:a0
10300     pbn-2-for-elan     elan-svlans-vlan-1300 1300 M1,MP   01:1e:86:00:28:3c
```

```
user@beb3> show l2-learning provider-instance
PBN Routing Instance: pbn-2-for-elan
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                S-VLAN   ISID       PBBN             B-VLAN   Flags
Bridging                               Bridging
Domain                                 Domain
elan1-svlan        1300     10300
elan2-svlan        1400     10400      elan-bvlan       3350     M1,MP
```

```
user@beb3> show l2-learning remote-backbone-edge-bridge
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : pbbn-1

   RBEB MAC                Time before       Flags
   Address                 expiry (SS:MS)
   00:1f:12:b8:3f:b0       770 :502
   00:21:59:aa:7f:b0       180 :503
```

```
user@beb3> show bridge mac-table

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : elan-bvlan, VLAN : 3350
   MAC                    MAC      Logical
   address                flags    interface
   00:1f:12:b8:38:11      D        ge-2/3/0.0
   00:21:59:aa:77:19      D        ge-2/3/0.0
   00:21:59:aa:78:11      D        ge-2/3/0.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbn-2-for-elan
 Bridging domain : elan1-svlan, ISID : 10300, VLAN : 1300

   MAC                    MAC      Logical                Remote
   address                flags    interface              MAC address
```



```
   00:00:00:00:00:01   D        pip0.1                 00:21:59:aa:7f:b0
   00:00:00:00:00:02   D        ge-2/0/0.3
   00:00:02:00:09:01   D        ge-2/0/0.3

Routing instance : pbn-2-for-elan
 Bridging domain : elan2-svlan, ISID : 10400, VLAN : 1400

   MAC                 MAC      Logical                Remote
   address             flags    interface              MAC address
   00:16:47:e3:5a:9b   D        ge-2/0/0.4
   00:00:05:00:00:01   D        pip0.1                 00:21:59:aa:7f:b0
```

Meaning Both operational mode commands **show l2-learning backbone-instance** and **show l2-learning provider-instance** show the B-component and I-component routing instances configured. The command **show l2-learning backbone-instance** also shows all the mappings from the B-component routing instance to the I-component routing instances. Likewise, the command **show l2-learning provider-instance** shows the mapping from the I-component routing instance to the corresponding B-component routing instance. PBBN routing instance **pbbn-1** contains the bridging domain **elan-bvlan**. The command **show l2-learning remote-backbone-edge-bridge** shows all remote BEB MACs.

The field **Time before expiry** shows the expiring timer:

- If a timer value is displayed, it means that C-MACS are not learned behind this remote BEB.
- If a timer value is *not* displayed, it means that C-MACS are learned behind this remote BEB.

To display the learned C-MACs behind the remote BEB, issue the command **show bridge mac-table**. The command will also show that for routing instance **ppbn-2-for-elan**, learning occurs through the pseudo-logical interface **pip0.1**.

Verifying E-LINE and E-LAN Service on BEB4

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB4 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb4> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : elan-bvlan, VLAN-ID : 3350

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN   Flags    Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
10400     pbn-3-for-elan    elan-svlans-vlan-1400 1400 O1,MP    01:1e:86:00:28:a0
10300     pbn-3-for-elan    elan-svlans-vlan-1300 1300 M1,MP    01:1e:86:00:28:3c

Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : eline-bvlan, VLAN-ID : 3150

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN   Flags    Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
10200     pbn-3-for-eline   eline-svlans-vlan-1200 1200 M1,P2P 01:1e:86:00:27:d8
10100     pbn-3-for-eline   eline-svlans-vlan-2100 2100 M1,P2P 01:1e:86:00:27:74

user@beb4> show l2-learning provider-instance
PBN Routing Instance: pbn-3-for-elan
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                 S-VLAN   ISID       PBBN             B-VLAN   Flags
Bridging                                Bridging
Domain                                  Domain
elan-svlans-vlan-1300 1300  10300       elan-bvlan       3350     M1,MP
elan-svlans-vlan-1400 1400  10400       elan-bvlan       3350     O1,MP

PBN Routing Instance: pbn-3-for-eline
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                 S-VLAN   ISID       PBBN             B-VLAN   Flags
Bridging                                Bridging
Domain                                  Domain
eline-svlans-vlan-1200 1200  10200      eline-bvlan      3150     M1,P2P
eline-svlans-vlan-2100 2100  10100      eline-bvlan      3150     M1,P2P

user@beb4> show l2-learning remote-backbone-edge-bridge

Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : pbbn-1

   RBEB MAC               Time before        Flags
   Address                expiry (SS:MS)
   00:21:59:aa:7f:b0             :
   00:22:83:32:df:b0             :
```



```
user@beb4> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : elan-bvlan, VLAN : 3350
   MAC                 MAC      Logical
   address             flags    interface
   00:21:59:aa:75:d4   D        ge-1/0/4.0
   00:21:59:aa:78:11   D        ge-1/0/4.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : eline-bvlan, VLAN : 3150
   MAC                 MAC      Logical
   address             flags    interface
   00:21:59:aa:75:d4   D        ge-1/0/4.0
   00:21:59:aa:78:11   D        ge-1/0/4.0
   00:21:59:aa:7f:b0   D        ge-1/0/4.0
   00:22:83:32:d8:11   D        ge-1/0/4.0
   00:22:83:32:df:b0   D        ge-1/0/4.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbn-1-for-elan
 Bridging domain : elan-svlans-vlan-1300, ISID : 10300, VLAN : 1300

   MAC                 MAC      Logical               Remote
   address             flags    interface             MAC address
   00:00:00:00:00:01   D        pip0.1                00:21:59:aa:7f:b0
   00:00:00:00:00:02   D        pip0.1                00:21:59:05:37:b0
   00:00:02:00:09:01   D        pip0.1                00:21:59:05:37:b0

Routing instance : pbn-1-for-elan
 Bridging domain : elan-svlans-vlan-1400, ISID : 10400, VLAN : 1400

   MAC                 MAC      Logical               Remote
   address             flags    interface             MAC address
   00:16:47:e3:5a:9b   D        pip0.1                00:21:59:05:37:b0
   00:00:05:00:00:01   D        pip0.1                00:21:59:aa:7f:b0
```

Meaning Both operational mode commands **show l2-learning backbone-instance** and **show l2-learning provider-instance** show the B-component and I-Component routing instances configured. The command **show l2-learning backbone-instance** also shows all the mappings from the B-component routing instance to the I-component routing instances. Likewise, the command **show l2-learning provider-instance** shows the mapping from the I-component routing instance to the corresponding B-component routing instance. PBBN routing instance **pbbn-1** contains the bridging domain **elan-bvlan**. The command **show l2-learning remote-backbone-edge-bridge** shows all remote BEB MACs.

The field **Time before expiry** shows the expiring timer:

- If a timer value is displayed, it means that C-MACS are not learned behind this remote BEB.

- If a timer value is *not* displayed, it means that C-MACS are learned behind this remote BEB.

To display the learned C-MACs behind the remote BEB, issue the command **show bridge mac-table**. The command will also show that for routing instance **pbn-3-for-eline**, learning is occurs through the pseudo-logical interface **pip0.0**.

Verifying E-LINE and E-LAN Service on BCB1

Purpose Verify the E-LINE and E-LAN service configuration on BCB1.

Action Use the following operational mode commands:

```
user@bcb1> show bridge mac-table

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : elan-bvlan, VLAN : 3350
   MAC                 MAC      Logical
   address             flags    interface
   00:1f:12:b8:38:11   D        ge-2/1/5.0
   00:1f:12:b8:3a:99   D        ge-2/1/5.0
   00:21:59:05:37:19   D        ge-2/3/0.0
   00:21:59:aa:78:11   D        ge-1/3/9.0
   00:21:59:aa:7c:8d   D        ge-1/3/9.0
   00:22:83:32:ef:22   D        ge-2/3/9.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : eline-bvlan-vlan-3150, VLAN : 3150
   MAC                 MAC      Logical
   address             flags    interface
   00:1f:12:b8:38:11   D        ge-2/1/5.0
   00:1f:12:b8:3f:b0   D        ge-2/1/5.0
   00:21:59:aa:78:11   D        ge-1/3/9.0
   00:21:59:aa:7f:b0   D        ge-1/3/9.0
   00:22:83:32:d8:11   D        ge-1/3/0.0
   00:22:83:32:df:b0   D        ge-1/3/0.0
```

Meaning The operational mode command **show bridge mac-table** displays the learned backbone MACs in the PBBN transport network. It also shows the two bridging domains **elan-bvlan** and **eline-bvlan** under the **pbbn-1** routing instance. Notice that C-MACs are not learned on BCB1.

Verifying E-LINE and E-LAN Service on BCB2

Purpose Verify the E-LINE and E-LAN service configuration on BCB2.

Action Use the following operational mode commands:

```
user@bcb1> show bridge mac-table

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : elan-bvlan, VLAN : 3350
   MAC                 MAC      Logical
   address             flags    interface
   00:1f:12:b8:38:11   D        ge-2/3/9.0
   00:21:59:aa:77:22   D        ge-2/3/9.0

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
 Bridging domain : eline-bvlan-vlan-3150, VLAN : 3150
   MAC                 MAC      Logical
   address             flags    interface
   00:1f:12:b8:38:11   D        ge-2/3/9.0
   00:1f:12:b8:3f:b0   D        ge-2/3/9.0
   00:22:83:32:d8:11   D        ge-2/3/9.0
   00:22:83:32:df:b0   D        ge-2/3/9.0
```

Meaning The operational mode command **show bridge mac-table** displays the learned backbone MACs in the PBBN transport network. It also shows the two bridging domains **elan-bvlan** and **eline-bvlan** under the **pbbn-1** routing instance. Notice that C-MACs are not learned on BCB2.

Verifying E-LINE and E-LAN Service on ES1

Purpose Verify the E-LINE and E-LAN service configuration on ES1.

Action Use the following operational mode commands:

```
user@es1> show bridge mac-table

Routing instance : cust-1
 Bridging domain : bds-vlan-0200, VLAN : 200

   MAC                 MAC      Logical
   address             flags    interface
   00:EE:01:00:02:00   D        ge-1/1/0.0
   00:EE:04:00:02:00   D        ge-1/0/0.2

Routing instance : cust-1
 Bridging domain : bds-vlan-0300, VLAN : 300

   MAC                 MAC      Logical
   address             flags    interface
   00:00:00:00:00:01   D        ge-1/1/0.0
   00:00:00:00:00:02   D        ge-2/0/0.3
   00:00:02:00:09:01   D        ge-2/0/0.3

Routing instance : cust-1
 Bridging domain : bds-vlan-0400, VLAN : 400

   MAC                 MAC      Logical
   address             flags    interface
   00:00:05:00:00:01   D        ge-1/1/0.0
   00:16:47:e3:5a:9b   D        ge-2/0/0.4
```

Meaning The operational mode command **show bridge mac-table** displays the routing instance **cust-1** and the associated bridging domains and MAC addresses learned in the bridging domain.

Verifying E-LINE and E-LAN Service on ES3

Purpose Verify the E-LINE and E-LAN service configuration on ES3.

Action Use the following operational mode commands:

```
user@es3> show bridge mac-table

Routing instance : cust-1
 Bridging domain : bds-vlan-0300, VLAN : 300

   MAC                 MAC      Logical
   address             flags    interface
   00:00:00:00:00:01   D        ge-2/0/0.3
   00:00:00:00:00:02   D        ge-1/1/0.0
   00:00:02:00:09:01   D        ge-1/1/0.0


Routing instance : cust-1
 Bridging domain : bds-vlan-0400, VLAN : 400

   MAC                 MAC      Logical
   address             flags    interface
   00:00:05:00:00:01   D        ge-2/0/0.4
   00:16:47:e3:5a:9b   D        ge-1/1/0.0
```

Meaning The operational mode command **show bridge mac-table** displays the routing instance **cust-1** and the associated bridging domain and MAC addresses learned in the bridging domain.

Verifying E-LINE and E-LAN Service on ES4

Purpose Verify the E-LINE and E-LAN service configuration on ES4.

Action Use the following operational mode commands:

```
user@es4> show bridge mac-table
Routing instance : cust-1
 Bridging domain : bds-vlan-0200, VLAN : 200

   MAC                  MAC      Logical
   address              flags    interface
   00:EE:01:00:02:00    D        ge-1/0/0.2
   00:EE:04:00:02:00    D        ge-1/0/3.0


Routing instance : cust-1
 Bridging domain : bds-vlan-0300, VLAN : 300

   MAC                  MAC      Logical
   address              flags    interface
   00:00:00:00:00:01    D        ge-1/0/0.3
   00:00:00:00:00:02    D        ge-1/0/0.3
   00:00:02:00:09:01    D        ge-1/0/0.3



Routing instance : cust-1
 Bridging domain : bds-vlan-0400, VLAN : 400

   MAC                  MAC      Logical
   address              flags    interface
   00:00:05:00:00:01    D        ge-1/0/0.4
   00:16:47:e3:5a:9b    D        ge-1/0/0.4
```

Meaning The operational mode command **show bridge mac-table** displays the routing instance **cust-1** and the associated bridging domains and MAC addresses learned in each bridging domain.

Related Documentation

- Understanding Provider Backbone Bridging on MX Series Routers on page 3
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

Example: Configuring CoS for a PBB Network on MX Series Routers

The IEEE 802.1ah provider backbone bridge (PBB) is a new standard for connecting and interoperating with provider backbone networks. Configure class-of-service (CoS) on your PBB to manage traffic to assure that service-level agreements (SLAs) are supported with the correct amount of bandwidth and quality of service. Using CoS, you can categorize traffic into classes and provide various levels of throughput and packet loss. This is especially important for traffic that is sensitive to jitter and delay, such as voice traffic.

This example describes how to configure and apply a basic CoS configuration to manage customer traffic:

- Requirements on page 81
- Overview and Topology on page 81

- Configuring CoS on an MX Series Router on page 85
- Verification on page 97

Requirements

This example uses the following hardware and software components:

- JUNOS Release 10.0 or later for MX Series routers
- One MX Series router in a PBB configuration

Before you configure the switch for CoS, be sure you have:

- Installed your MX Series router.
- Performed the initial router configuration.
- Configured basic PBB in the topology, and verified that traffic is flowing in the topology. For information about configuring PBB, see ""Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers" on page 17."

Overview and Topology

Figure 4 on page 82 displays the network topology for this example. Four service paths (**eline1**, **eline2**, **elan1**,and **elan2**) are configured on ES4. Ingress traffic is entering ES4 through interface **ge-1/0/3** and egressing through interface **ge-1/0/0**. Class of service is applied only to ES4 since it is at the edge.

Figure 4: Network Topology for CoS for Provider Backbone Bridging

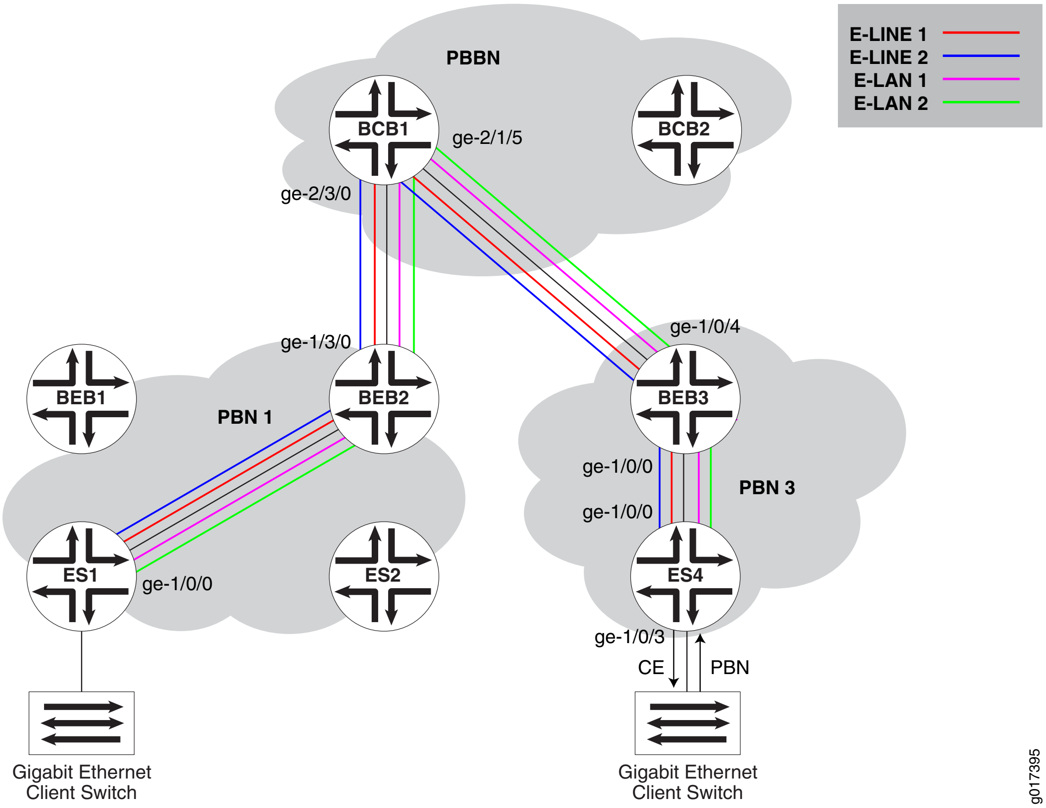


Figure 5 on page 83 shows the relationship of the forwarding classes that are used in this example. The three forwarding classes are **Voice-EF**, **VPN-PR-DATA**, and **INET-BEST-EFFORT**. These forwarding classes are associated with E-LINE 1, E-LINE 2, E-LAN 1, and E-LAN 2.

E-LINE 1 and E-LINE 2 are bundled into interface set **vuni-set1**. E-LAN 1 and E-LAN 2 are bundled into interface set **vuni-set2**. Interface sets provide the same function as a virtual UNI in the carrier Ethernet world. An interface set is used to group a set of logical interfaces under a port and then transport packets through the member logical interface.

Figure 5: Egress Shaping

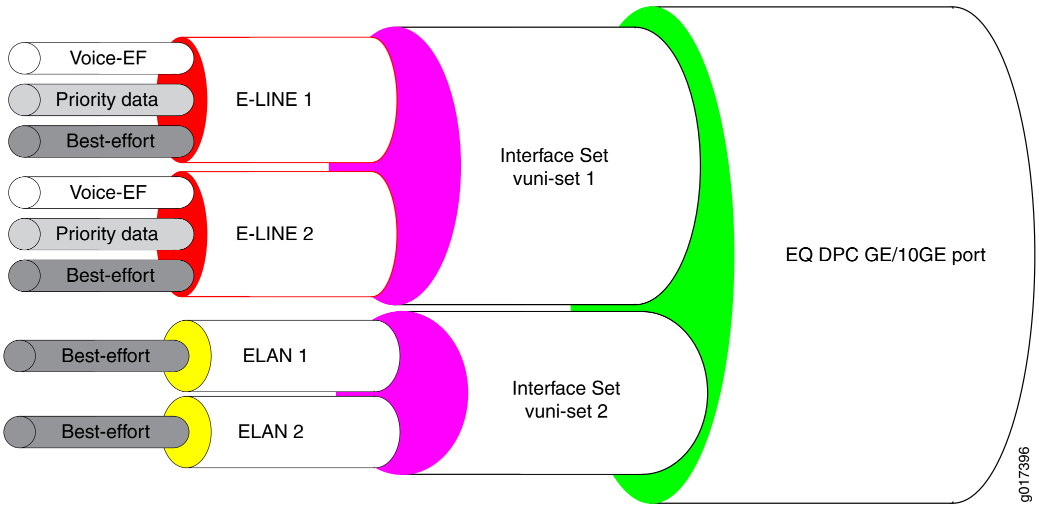


Table 9 on page 83 shows the services, traffic rates, and the egress SLA that are configured in this example.

Table 9: Egress SLA Enforcement

Service	Traffic Rate Applied for Example	Egress SLA
eline1 from ES1 —> ES4 • **VOICE-EF** forwarding class is used for voice • **VPN-PR-DATA** forwarding class is used for priority data • **VOICE-EF** forwarding class	Physical interface **ge-1/0/3** and interface sets **vuni-set1** and **interface-set2** • 10 Mbps for voice • 40 Mbps for priority • 40 Mbps for best effort	At egress, shaping (using schedulers) is configured at the [**edit interfaces interface-set**] hierarchy level. The scheduler ensures that voice and data traffic is given a higher priority to protect these traffic classes during congestion. • 10 Mbps for voice • 40 Mbps for priority • 25 Mbps for best effort NOTE: Traffic is limited to 100 Mbps due to the physical restrictions of the interface on which it travels.
eline2 from ES1—> ES4 • **INET-BEST-EFFORT** forwarding class	60 Mbps	25 Mbps NOTE: After scheduling voice and data traffic, the remaining 50 Mbps is shared by the best effort traffic in **eline1** and **eline2**.

Ingress traffic travels into the ES4 router and through the network to the ES1 router. Figure 6 on page 84 shows the three levels of service that will be entering E-LINE 1 on ES4. Voice, priority data, and best-effort traffic will be policed in different ways. Voice traffic can receive 15 Mbps, priority data can receive 50 Mbps, and best-effort traffic isn't policed at all—it operates on what bandwidth is left after servicing voice and priority traffic.

Figure 6: Achieving Ingress SLA by Applying Policers for Each Traffic Class

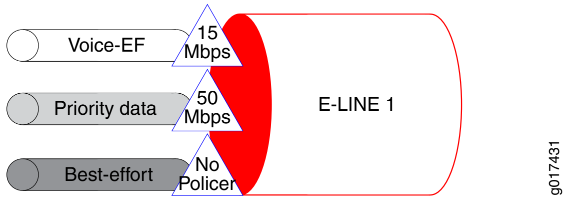


Table 10 on page 84 provides more information about the services, traffic rates, and the ingress SLA that are configured in this example.

Table 10: Ingress SLA Enforcement

Service	Traffic Rate Applied for Example	Ingress SLA
eline1 to ES4 —> ES1 • **VOICE-EF** forwarding class is used for voice and uses the IEEE 802.1P classifier P-Bit 7 • **VPN-PR-DATA** forwarding class is used for priority data the IEEE 802.1P classifier P-Bit 4 • **INET-BEST-EFFORT** forwarding class is used for best effort traffic and uses the IEEE 802.1P classifier P-Bit 0	Traffic is entering the topology at the following rates: • 10 Mbps for voice • 70 Mbps for priority • 40 Mbps for best effort	Traffic will be policed at the following rates: • 15 Mbps for voice • 50 Mbps for priority • No policer for best effort—all 40 Mbps traffic is accepted
eline2 to ES4 —> ES1 • **INET-BEST-EFFORT** forwarding class and uses the IEEE 802.1P classifier P-Bit 0	60 Mbps	No policer—all 60 Mbps traffic is accepted

Table 11 on page 84 shows the different properties that will be configured for CoS on MX Series router ES4.

Table 11: Components of the Topology for Configuring CoS on MX Series Routers

Property	Settings
Interface sets	The following interface sets are configured to transport customer traffic: • Interface set **vuni-set1** carries **eline1** on logical interface **ge-1/0/3.1** and **eline2** on logical interface **ge-1/0/3.2**. • Interface set **vuni-set2** carries **elan1** on logical interface **ge-1/0/3.3** and **elan2** on logical interface **ge-1/0/3.4**.
Forwarding classes	The following forwarding classes are configured: • **INET-BEST-EFFORT**, queue number **0** • **VPN-PR-DATA**, **50** Mbps limit, queue number 1 • **VOICE-EF**, **15** Mbps limit, queue number **2**

Table 11: Components of the Topology for Configuring CoS on MX Series Routers *(continued)*

Property	Settings
Firewall filters	The following firewall filters are configured: • **SERVICE1** • **SERVICE2** • **SERVICE3**
Schedule map and schedulers	The schedule map **EVC** contains the following schedulers: • **BE** is used for the forwarding class **INET-BEST-EFFORT** • **PD** is used for the forwarding class **VPN-PR-DATA** • **EF** is used for the forwarding class **VOICE-EF** The schedulers are markings that can be used by the next router to reprioritize traffic.
Rewrite rules	Rewrite rules (one for 802.1p class packets and one for 802.1ad class packets) are used for conforming and non-conforming traffic. If low, it goes out code-point 010. If high (which means it violated the SLA of the service provider), it goes out code-point 110.

In provider backbone networks, CoS information is mapped and carried across the network using behavior aggregate (BA) classifiers; specifically, 3 bits of priority code point (PCP) and 1 bit of DEI (drop eligibility indicator). Classifiers provide the capability to classify, map, and rewrite (mark) the PCP+DEI bits from one tag to another across the carrier Ethernet network.

In the following example, you will configure and apply basic CoS features to customer traffic entering interface **ge-1/0/3** and exiting interface **ge-1/0/0** on the ES4 router. Traffic is mapped to forwarding classes **INET-BEST-EFFORT**, **VPN-PR-DATA**, or **VOICE-EF**. Bandwidth is limited to **50** Mbps for forwarding classes **INET-BEST-EFFORT** and **VPN-PR-DATA**. Bandwidth is limited to **15** Mbps for forwarding class **VOICE-EF**. Rewrite rules are configured for each E-LINE to add marking that can be used by the next router (here, BEB3) to reprioritize traffic from a particular code point. The forwarding classes are marked with code points so that they all “agree” to a specific CoS policy.

CoS is only applied on the ES4 because it is located at the customer edge.

Configuring CoS on an MX Series Router

• Configuring CoS on ES4 on page 85

Configuring CoS on ES4

CLI Quick Configuration

To quickly configure CoS, copy the following commands and paste them into the router terminal window:

```
[edit]
set class-of-service forwarding-classes class INET-BEST-EFFORT queue-num 0
set class-of-service forwarding-classes class VPN-PR-DATA queue-num 1
set class-of-service forwarding-classes class VOICE-EF queue-num 2
set class-of-service forwarding-classes class UNUSED queue-num 3
set class-of-service classifiers ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority low code-points 000
```

```
set class-of-service classifiers ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority low code-points 001
set class-of-service classifiers ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority high code-points 010
set class-of-service classifiers ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority high code-points 011
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VPN-PR-DATA loss-priority
low code-points 100
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VPN-PR-DATA loss-priority
high code-points 101
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VOICE-EF loss-priority
low code-points 111
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VOICE-EF loss-priority
high code-points 110
set class-of-service traffic-control-profiles EVC:SERVICE scheduler-map EVC
set class-of-service traffic-control-profiles EVC:SERVICE shaping-rate 20m
set class-of-service traffic-control-profiles VUNI:SERVICE scheduler-map EVC
set class-of-service traffic-control-profiles VUNI:SERVICE shaping-rate 100m
set class-of-service traffic-control-profiles VUNI:SERVICE guaranteed-rate 100m
set class-of-service interfaces interface-set vuni-set1 output-traffic-control-profile VUNI:SERVICE
set class-of-service interfaces interface-set vuni-set2 output-traffic-control-profile VUNI:SERVICE
set class-of-service interfaces ge-1/0/0 unit 1 classifiers ieee-802.1 802p_class
set class-of-service interfaces ge-1/0/0 unit 1 rewrite-rules ieee-802.1 802p_rwrule
set class-of-service interfaces ge-1/0/0 unit 2 classifiers ieee-802.1 802p_class set ge-1/0/0 unit
2 rewrite-rules ieee-802.1 802p_rwrule
set class-of-service interfaces ge-1/0/0 unit 3 forwarding-class INET-BEST-EFFORT
set class-of-service interfaces ge-1/0/0 unit 4 forwarding-class INET-BEST-EFFORT
set class-of-service interfaces ge-1/0/3 unit 1 output-traffic-control-profile EVC:SERVICE
set class-of-service interfaces ge-1/0/3 unit 1 classifiers ieee-802.1 802p_class
set class-of-service interfaces ge-1/0/3 unit 1 rewrite-rules ieee-802.1 802p_rwrule
set class-of-service interfaces ge-1/0/3 unit 2 classifiers ieee-802.1 802p_class
set class-of-service interfaces ge-1/0/3 unit 2 rewrite-rules ieee-802.1 802p_rwrule
set class-of-service interfaces ge-1/0/3 unit 3 forwarding-class INET-BEST-EFFORT
set class-of-service interfaces ge-1/0/3 unit 4 forwarding-class INET-BEST-EFFORT
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA
loss-priority low code-point 010
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA
loss-priority high code-point 110
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class VOICE-EF loss-priority
low code-point 011
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class VOICE-EF loss-priority
high code-point 111
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class INET-BEST-EFFORT
loss-priority low code-point 100
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class INET-BEST-EFFORT
loss-priority high code-point 000
set class-of-service scheduler-maps EVC forwarding-class INET-BEST-EFFORT scheduler BE
set class-of-service scheduler-maps EVC forwarding-class VPN-PR-DATA scheduler PD
set class-of-service scheduler-maps EVC forwarding-class VOICE-EF scheduler EF
set class-of-service schedulers BE transmit-rate percent 30
set class-of-service schedulers BE buffer-size percent 30
set class-of-service schedulers BE priority low set PD transmit-rate percent 40
set class-of-service schedulers PD buffer-size percent 40
set class-of-service schedulers PD priority high
set class-of-service schedulers EF transmit-rate percent 10
set class-of-service schedulers EF buffer-size percent 10
set class-of-service schedulers EF priority strict-high deactivate class-of-service
set firewall policer 15m-pol if-exceeding bandwidth-limit 15m set policer 15m-pol if-exceeding
burst-size-limit 60k
```



```
set firewall policer 15m-pol then discard set policer 50m-pol if-exceeding bandwidth-limit 50m
set firewall relative set policer 50m-pol if-exceeding burst-size-limit 150k set policer 50m-pol
then discard
set firewall policer 30m-pol if-exceeding bandwidth-limit 30m
set firewall policer 30m-pol if-exceeding burst-size-limit 45k
set firewall policer 30m-pol then discard
set firewall policer 40m-pol if-exceeding bandwidth-limit 40m
set firewall policer 40m-pol if-exceeding burst-size-limit 45k
set firewall policer 40m-pol then discard
set firewall family bridge filter SERVICE1 interface-specific
set firewall family bridge filter SERVICE1 term Voice_bw_prof from forwarding-class VOICE-EF
set firewall family bridge filter SERVICE1 term Voice_bw_prof then policer 15m-pol
set firewall family bridge filter SERVICE1 term Voice_bw_prof then count srv1_voice_cnt
set firewall family bridge filter SERVICE1 term VPN_pd_bw_prof from forwarding-class
VPN-PR-DATA
set firewall family bridge filter SERVICE1 term VPN_pd_bw_prof then policer 50m-pol
set firewall family bridge filter SERVICE1 term VPN_pd_bw_prof then count srv1_vpn_cnt
set firewall family bridge filter SERVICE1 term ANY then count srv1_inet_cnt
set firewall family bridge filter SERVICE2 term Voice_sw_prof from forwarding-class VOICE-EF
set firewall family bridge filter SERVICE2 term Voice_sw_prof then policer 40m-pol
set firewall family bridge filter SERVICE2 term Voice_sw_prof then count srv2_ef_cnt
set firewall family bridge filter SERVICE2 term PR_DATA_policer from forwarding-class
VPN-PR-DATA
set firewall family bridge filter SERVICE2 term PR_DATA_policer then policer 30m-pol
set firewall family bridge filter SERVICE2 term PR_DATA_policer then count srv2_pr_data_cnt
set firewall family bridge filter SERVICE2 term ANY then count srv2_be_cnt
set firewall family bridge filter SERVICE3 term ANY then count srv3_cnt
set firewall family bridge filter SERVICE3 term ANY then forwarding-class INET-BEST-EFFORT
```

Step-by-Step Procedure

To configure and apply CoS:

1. Configure one-to-one mapping between forwarding classes and queues:

   ```
   [edit class-of-service forwarding-classes]
   user@es4# set class INET-BEST-EFFORT queue-num 0
   user@es4# set class VPN-PR-DATA queue-num 1
   user@es4# set class VOICE-EF queue-num 2
   user@es4# set class VOICE-EF priority high
   user@es4# set class UNUSED queue-num 3
   ```

2. Define the firewall filter **SERVICE1** and use the statement **interface-specific** to creates a specific SLA so that the ELINE or EVC will receive its own policy and each interface will its own copy of the rule—without this, the rule is shared:

   ```
   [edit firewall family bridge]
   user@es4# set filter SERVICE1 interface-specific
   ```

3. Define the terms **Voice_bw_prof**, **Voice_pd_bw_prof**, **Voice_bw_prof**, **VPN_pd_bw_prof**, and **ANY** for the **SERVICE1** filter:

   ```
   [edit firewall family bridge filter SERVICE1]
   user@es4# set term Voice_bw_prof then policer 15m-pol
   user@es4#set term Voice_bw_prof then count srv1_voice_cnt
   user@es4#set term VPN_pd_bw_prof from forwarding-class VPN-PR-DATA
   user@es4#set term Voice_bw_prof from forwarding-class VOICE-EF
   user@es4# set term VPN_pd_bw_prof then policer 50m-pol
   user@es4#set term VPN_pd_bw_prof then count srv1_vpn_cnt
   user@es4# set term ANY then count srv1_inet_cnt
   ```

4. Define the firewall filter **SERVICE2**:

   ```
   [edit firewall family bridge]
   user@es4# set filter SERVICE2
   ```

5. Define the terms **Voice_sw_prof**, **PR_DATA_policer**, and **ANY** for the **SERVICE2** filter:

```
[edit firewall family bridge filter SERVICE2]
user@es4# Voice_sw_prof from forwarding-class VOICE-EF
user@es4# set term Voice_sw_prof then policer 40m-pol
user@es4# set term Voice_sw_prof then count srv2_ef_cnt
user@es4# set term PR_DATA_policer from forwarding-class VPN-PR-DATA
user@es4#set term PR_DATA_policer then policer 30m-pol
user@es4#set term PR_DATA_policer then count srv2_pr_data_cnt
user@es4#set term ANY then count srv2_be_cnt
```

6. Define the firewall filter **SERVICE3**:

```
[edit firewall family bridge]
user@es4# set filter SERVICE3
```

7. Define the term **ANY** for the **SERVICE3** filter:

```
[edit firewall family bridge filter SERVICE3]
user@es4# set term ANY then count srv3_cnt
user@es4# set term ANY then forwarding-class INET-BEST-EFFORT
```

8. Apply the firewall filter **SERVICE1** and **SERVICE2** as an input filter to the interfaces for the servers hosting services:

```
[edit interfaces]
user@es4# set ge-1/0/3 unit 1 family bridge filter input SERVICE1
user@es4# set ge-1/0/3 unit 2 family bridge filter input SERVICE2
```

9. Configure classifiers to classify the packets in the customer's VPN:

```
[edit class-of-service classifiers]
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT loss-priority
low code-points 000
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT loss-priority
low code-points 001
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT loss-priority
high code-points 010
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT loss-priority
high code-points 011
user@es4# set ieee-802.1 802p_class forwarding-class VPN-PR-DATA loss-priority low
code-points 100
user@es4# set ieee-802.1 802p_class forwarding-class VPN-PR-DATA loss-priority high
code-points 101
user@es4#  set ieee-802.1 802p_class forwarding-class VOICE-EF loss-priority low
code-points 111
user@es4# set ieee-802.1 802p_class forwarding-class VOICE-EF loss-priority high
code-points 110
```

10. Configure policers to limit traffic of a certain class to a specified bandwidth and burst size:

```
[edit firewall]
user@es4# set policer 15m-pol if-exceeding bandwidth-limit 15m
user@es4# set policer 15m-pol if-exceeding burst-size-limit 60k
user@es4# set policer 15m-pol then discard
user@es4# set policer 50m-pol if-exceeding bandwidth-limit 50m
user@es4# set policer 50m-pol if-exceeding burst-size-limit 150k
user@es4# set policer 50m-pol then discard
user@es4# set policer 30m-pol if-exceeding bandwidth-limit 30m
user@es4# set policer 30m-pol if-exceeding burst-size-limit 45k
user@es4# set policer 30m-pol then discard
user@es4# set policer 40m-pol if-exceeding bandwidth-limit 40m
user@es4# set policer 40m-pol if-exceeding burst-size-limit 45k
user@es4# set policer 40m-pol then discard
```

11. Configure schedulers to determine which queue to service based on the transmit rate and the buffer size:

    ```
    [edit class-of-service schedulers]
    user@es4# set BE transmit-rate percent 30
    user@es4# set BE buffer-size percent 30
    user@es4# set BE priority low set PD transmit-rate percent 40
    user@es4# set PD buffer-size percent 40
    user@es4# set PD priority high
    user@es4# set EF transmit-rate percent 10
    user@es4# set EF buffer-size percent 10
    user@es4# set EF priority strict-high
    ```

12. Assign the forwarding classes to schedulers with the scheduler map **EVC**:

    ```
    [edit class-of-service scheduler-maps]
    user@es4# set EVC forwarding-class INET-BEST-EFFORT scheduler BE
    user@es4# set EVC forwarding-class VPN-PR-DATA scheduler PD
    user@es4# set EVC forwarding-class VOICE-EF scheduler EF
    ```

13. Configure an 802.1p rewrite rule named **802p_rwrule** in the rewrite table and associate them with forwarding classes:

    ```
    [edit class-of-service rewrite-rules (Definition)]
    user@es4# set ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA loss-priority low
    code-point 010
    user@es4# set ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA loss-priority high
    code-point 110
    user@es4# set ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA loss-priority high
    code-point 110
    user@es4# set ieee-802.1 802p_rwrule forwarding-class VOICE-EF loss-priority low
    code-point 011
    user@es4# set ieee-802.1 802p_rwrule forwarding-class VOICE-EF loss-priority high
    code-point 111
    user@es4# set ieee-802.1 802p_rwrule forwarding-class INET-BEST-EFFORT loss-priority
    low code-point 100
    user@es4# set ieee-802.1 802p_rwrule forwarding-class INET-BEST-EFFORT loss-priority
    high code-point 000
    ```

14. Configure traffic control profiles. These policies are applied to enqueue a packet and send it out to the next router. The profile **VUNI:SERVICE** will be applied to interface set **vuni-set1**.

    ```
    [edit class-of-service traffic-control-profiles]
    user@es4# set EVC:SERVICE scheduler-map EVC
    user@es4# set EVC:SERVICE shaping-rate 20m
    user@es4# set VUNI:SERVICE scheduler-map EVC
    user@es4# set VUNI:SERVICE shaping-rate 100m
    user@es4# set VUNI:SERVICE guaranteed-rate 100m
    ```

15. Configure the interface sets and associate them with the logical interfaces on which the services are configured (**vuni-set1** is used for **eline1** and **eline2** traffic, and **vuni-set2** is used for **elan1** and **elan2** traffic):

    ```
    [edit interfaces]
    user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 1
    user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 3
    user@es4# set interface-set vuni-set2 interface ge-1/0/3 unit 4
    user@es4# set interface-set vuni-set2 interface ge-1/0/3 unit 2
    ```

16. Configure the output traffic control profile to apply the policy that queues packets and sends them onto the next router (here, policies **VUNI:SERVICE** and **EVC:SERVICE** are applied):

```
[edit class-of-service interfaces]
user@es4# set interface-set vuni-set1 output-traffic-control-profile VUNI:SERVICE
user@es4# set interface-set vuni-set2 output-traffic-control-profile VUNI:SERVICE
user@es4# set ge-1/0/3 unit 1 output-traffic-control-profile EVC:SERVICE
```

17. Apply classifiers and rewrite rules to the logical interfaces supporting the services:

```
[edit class-of-service interfaces]
user@es4# set ge-1/0/0 unit 1 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/0 unit 1 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/0 unit 2 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/0 unit 2 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/0 unit 3 forwarding-class INET-BEST-EFFORT
user@es4# set ge-1/0/0 unit 4 forwarding-class INET-BEST-EFFORT
user@es4# set ge-1/0/3 unit 1 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/3 unit 1 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/3 unit 2 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/3 unit 2 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/3 unit 3 forwarding-class INET-BEST-EFFORT
user@es4# set ge-1/0/3 unit 4 forwarding-class INET-BEST-EFFORT
```

Results Check the results of the configuration:

```
user@switch1> show configuration
class-of-service {
  classifiers {
    # P-BIT 7, 6 => VOICE ef
    # P-BIT 4, 5 => VPN Priority data
    # Others => Internet Best effort
    ieee-802.1 802p_class {
      forwarding-class INET-BEST-EFFORT {
        loss-priority low code-points [ 000 001 ];
        loss-priority high code-points [ 010 011 ];
      }
      forwarding-class VPN-PR-DATA {
        loss-priority low code-points 100;
        loss-priority high code-points 101;
      }
      forwarding-class VOICE-EF {
        loss-priority low code-points 111;
        loss-priority high code-points 110;
      }
    }
  }
  forwarding-classes {
    class INET-BEST-EFFORT queue-num 0;
    class VPN-PR-DATA queue-num 1;
    class VOICE-EF queue-num 2 priority high;
    class UNUSED queue-num 3;
  }
  traffic-control-profiles {
    EVC:SERVICE {
      scheduler-map EVC;
      shaping-rate 20m;
    }
    VUNI:SERVICE {
      scheduler-map EVC;
      shaping-rate 100m;
```



```
        guaranteed-rate 100m;
    }
}
interfaces {
    interface-set vuni-set1 {
        # vuni-set1 is grouped E-LINE services
        output-traffic-control-profile VUNI:SERVICE;
    }
    interface-set vuni-set2 {
        # vuni-set2 is grouped E-LAN services
        output-traffic-control-profile VUNI:SERVICE;
    }
    ge-1/0/0 {
        # ge-1/0/0 is customer edge
        unit 1 {
            classifiers {
                ieee-802.1 802p_class;
            }
            rewrite-rules {
                ieee-802.1 802p_rwrule;
            }
        }
        unit 2 {
            classifiers {
                ieee-802.1 802p_class;
            }
            rewrite-rules {
                ieee-802.1 802p_rwrule;
            }
        }
        unit 3 {
            forwarding-class INET-BEST-EFFORT;
        }
        unit 4 {
            forwarding-class INET-BEST-EFFORT;
        }
    }
    ge-1/0/3 {
        unit 1 {
            # In hierarchical-scheduler mode:
            # EVC can be shaped at EVC (unit) level in addition to
            # being shaped at virtual-UNI and port-level
            # But this level is currently disabled
            # classification of incoming UNI traffic for ELINE1
            classifiers {
                ieee-802.1 802p_class;
            }
            # marking of .1p bits of outgoing UNI traffic
            rewrite-rules {
                ieee-802.1 802p_rwrule;
            }
        }
        unit 2 {
            # classification of incoming UNI traffic for ELINE2
            classifiers {
                ieee-802.1 802p_class;
```

```
            }
            # marking of .1p bits of outgoing UNI traffic
            rewrite-rules {
                ieee-802.1 802p_rwrule;
            }
        }
        unit 3 {
            # fixed-classification for ELAN1, all ELAN traffic is
            # best effort
            forwarding-class INET-BEST-EFFORT;
        }
        unit 4 {
            # fixed-classification for ELAN2, all ELAN traffic is
            # best effort
            forwarding-class INET-BEST-EFFORT;
        }
    }
}
rewrite-rules {
    ieee-802.1 802p_rwrule {
        forwarding-class VPN-PR-DATA {
            loss-priority low code-point 010;
            loss-priority high code-point 110;
        }
        forwarding-class VOICE-EF {
            loss-priority low code-point 011;
            loss-priority high code-point 111;
        }
        forwarding-class INET-BEST-EFFORT {
            loss-priority low code-point 100;
            loss-priority high code-point 000;
        }
    }
}
scheduler-maps {
    EVC {
        forwarding-class INET-BEST-EFFORT scheduler BE;
        forwarding-class VPN-PR-DATA scheduler PD;
        forwarding-class VOICE-EF scheduler EF;
    }
}
schedulers {
    BE {
        transmit-rate percent 30;
        buffer-size percent 30;
        priority low;
    }
    PD {
        transmit-rate percent 40;
        buffer-size percent 40;
        priority high;
    }
    EF {
        transmit-rate percent 10;
        buffer-size percent 10;
        priority strict-high;
```

```
                }
            }
        }
    firewall {
        policer 15m-pol {
            if-exceeding {
                bandwidth-limit 15m;
                burst-size-limit 5k;
            }
            then discard;
        }
        policer 50m-pol {
            if-exceeding {
                bandwidth-limit 50m;
                burst-size-limit 30k;
            }
            then discard;
        }
        policer 30m-pol {
            if-exceeding {
                bandwidth-limit 30m;
                burst-size-limit 45k;
            }
            then discard;
        }
        policer 40m-pol {
            if-exceeding {
                bandwidth-limit 40m;
                burst-size-limit 45k;
            }
            then discard;
        }
        family bridge {
            filter SERVICE1 {
                # bandwidth profile for Voice service
                interface-specific;
                term Voice_bw_prof {
                    from {
                        forwarding-class VOICE-EF;
                    }
                    then {
                        policer 15m-pol;
                        count srv1_voice_cnt;
                    }
                }
                # bandwidth profile for VPN priority-data service
                term VPN_pd_bw_prof {
                    from {
                        forwarding-class VPN-PR-DATA;
                    }
                    then {
                        policer 50m-pol;
                        count srv1_vpn_cnt;
                    }
                }
                # everything else is best-effort internet
```

```
                term ANY {
                    then count srv1_inet_cnt;
                }
            }
            filter SERVICE2 {
                term Voice_sw_prof {
                    from {
                        forwarding-class VOICE-EF;
                    }
                    then {
                        policer 40m-pol;
                        count srv2_ef_cnt;
                    }
                }
                term PR_DATA_policer {
                    from {
                        forwarding-class VPN-PR-DATA;
                    }
                    then {
                        policer 30m-pol;
                        count srv2_pr_data_cnt;
                    }
                }
                term ANY {
                    then count srv2_be_cnt;
                }
            }
            filter SERVICE3 {
                term ANY {
                    then {
                        count srv3_cnt;
                        forwarding-class INET-BEST-EFFORT;
                    }
                }
            }
        }
    }
# Interface configuration shown for completeness-done for PBB E-LINE and PBB-E-LAN
  example
interfaces {
    ge-1/0/0 {
        description "Connected to ES4 Reds ge-1/0/0";
        flexible-vlan-tagging;
        encapsulation flexible-ethernet-services;
        unit 1 {
            family bridge {
                interface-mode trunk;
                vlan-id-list 2100;
                vlan-rewrite {
                    translate 1100 2100;
                }
            }
        }
        unit 2 {
            family bridge {
                interface-mode trunk;
```



```
            vlan-id-list 1200;
        }
    }
    unit 3 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1300;
        }
    }
    unit 4 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1400;
        }
    }
}
ge-1/0/4 {
    description "Connected to BCB1 Syrah ge-2/1/5";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
ge-1/2/2 {
    description "Connected to BCB2 Cabernet ge-2/0/6";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
cbp0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type bvlan;
            isid-list all;
        }
    }
}
pip0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
    unit 1 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
```

```
            }
        }
    }
}
# routing-instances configuration shown for completeness
# routing-instances configuration done for PBB E-LINE and PBB-E-LAN example
routing-instances {
    pbn-3-for-eline {
        instance-type virtual-switch;
        interface ge-1/0/0.1;
        interface ge-1/0/0.2;
        interface pip0.0;
        bridge-domains {
            eline-svlans {
                vlan-id-list [ 1200 2100 ];
            }
        }
        pbn-3-for-elan {
            instance-type virtual-switch;
            interface ge-1/0/0.3;
            interface ge-1/0/0.4;
            interface pip0.1;
            bridge-domains {
                elan-svlans {
                    vlan-id-list [ 1300 1400 ];
                }
            }
            pbb-options {
                peer-instance pbbn-1;
            }
            service-groups {
                elan1 {
                    service-type elan;
                    pbb-service-options {
                        isid 10300 vlan-id-list 1300;
                    }
                }
                elan2 {
                    service-type elan;
                    pbb-service-options {
                        isid 10400 vlan-id-list 1400;
                    }
                }
            }
        }
        pbb-options {
            peer-instance pbbn-1;
        }
        service-groups {
            eline1 {
                service-type eline;
                pbb-service-options {
                    isid 10100 interface ge-1/0/0.1;
                }
            }
            eline2 {
```



```
                    service-type eline;
                    pbb-service-options {
                        isid 10200 interface ge-1/0/0.2;
                    }
                }
            }
        }
    }
```

Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying Ingress SLA Enforcement on page 97
- Verifying Egress SLA on page 99
- Verify Traffic Shaping and Scheduling Profiles on page 99
- Verifying Schedulers and the Scheduler Map on page 100
- Egress SLA Enforcement on page 101

Verifying Ingress SLA Enforcement

Purpose Verify that SLA enforcement is occurring for traffic entering ES4 and exiting towards ES1. The policers for the forwarding classes are:

- 15 Mbps for voice traffic
- 50 Mbps for priority data
- No policer for best effort—all traffic within 40 Mbps is accepted

Action Use the following operational mode command:

```
user@es4> show firewall
Filter: __default_bpdu_filter__

Filter: SERVICE1-ge-1/0/3.1-i
Counters:
Name                                          Bytes              Packets
srv1_vpn_cnt-ge-1/0/3.1-i              899929660584            644648754
srv1_voice_cnt-ge-1/0/3.1-i            183642199700            175737551
srv1_inet_cnt-ge-1/0/3.1-i             359309729428            257385193
Policers:
Name                                        Packets
50m-pol-VPN_pd_bw_prof-ge-1/0/3.1-i       255914707
15m-pol-Voice_bw_prof-ge-1/0/3.1-i                0

Filter: SERVICE2
Counters:
Name                                          Bytes              Packets
srv2_pr_data_cnt                                  0                    0
srv2_ef_cnt                              2953233408             46144272
srv2_be_cnt                                       0                    0
Policers:
Name                                        Packets
30m-pol-PR_DATA_policer                           0
---(more)---                    40m-pol-Voice_sw_prof
        0

Filter: SERVICE3
Counters:
Name                                          Bytes              Packets
srv3_cnt                                          0                    0

Filter: __default_arp_policer__

Filter: __cfm_filter_bds-vlan-0500_6__
Counters:
Name                                          Bytes              Packets
__cfm_ethtype_term__                            750                   15
__cfm_erp_term__                                  0                    0
__ge-1/0/3.5_cc_term_lvl_0__                      0                    0
__ge-1/0/3.5_cc_term_lvl_1__                      0                    0
__ge-1/0/3.5_cc_term_lvl_2__                      0                    0
__ge-1/0/3.5_lt_term_lvl_0__                      0                    0
__ge-1/0/3.5_lt_term_lvl_1__                      0                    0
__ge-1/0/3.5_lt_term_lvl_2__                      0                    0
__ge-1/0/3.5_cc_term_lvl_3__                      0                    0
__ge-1/0/3.5_cc_term_lvl_4__                      0                    0
__ge-1/0/3.5_cc_term_lvl_5__                      0                    0
  ge-1/0/3.5_cc_term_lvl_6__                      0                    0
__ge-1/0/3.5_cc_term_lvl_7__                      0                    0
__ge-1/0/3.5_lt_term_lvl_3__                      0                    0
__ge-1/0/3.5_lt_term_lvl_4__                      0                    0
__ge-1/0/3.5_lt_term_lvl_5__                      0                    0
__ge-1/0/3.5_lt_term_lvl_6__                      0                    0
__ge-1/0/3.5_lt_term_lvl_7__                      0                    0
__mgrp_1_cc_term_lvl_0__                          0                    0
__mgrp_1_cc_term_lvl_1__                          0                    0
__mgrp_1_cc_term_lvl_2__                          0                    0
__mgrp_1_cc_term_lvl_3__                  111794828              1152524
__mgrp_1_cc_term_lvl_4__                          0                    0
```



```
__mgrp_1_cc_term_lvl_5__                                     0                     0
__mgrp_1_cc_term_lvl_6__                                     0                     0
__mgrp_1_cc_term_lvl_7__                                     0                     0
__mgrp_1_lt_term_lvl_0__                                     0                     0
__mgrp_1_lt_term_lvl_1__                                     0                     0
__mgrp_1_lt_term_lvl_2__                                     0                     0
__mgrp_1_lt_term_lvl_3__                                  1152                    18
__mgrp_1_lt_term_lvl_4__                                     0                     0
__mgrp_1_lt_term_lvl_5__                                     0                     0
__mgrp_1_lt_term_lvl_6__                                     0                     0
__mgrp_1_lt_term_lvl_7__                                     0                     0
[truncated]
```

Meaning The operational mode command **show firewall** displays statistics about the firewall filters. Under the **Filter: SERVICE1** region, the values **50–pol-VPN_pd_bw_prof-ge-1/0/3.1–I** and **15–pol-Voice_bw_prof-ge-1/0/3.1–I** indicate that each forwarding class is policed to a certain bandwidth rate. The **Bytes** value for **50–pol-VPN_pd_bw_prof-ge-1/0/3.1–I** is **255914707**, which exceeds the 50 Mbps bandwidth limit for priority data. Packets exceeding 50 Mbps will be dropped.

Verifying Egress SLA

Purpose Verify that SLA enforcement is occurring for traffic coming from ES1 towards ES4. Only 100 Mbps can egress ES1. Voice traffic and priority data take precedence over best-effort traffic.

Action Use the following operational mode commands:

```
user@es4> show class-of-service interface-set
Interface-set: vuni-set1, Index: 1
Physical interface: ge-1/0/3, Index: 151
Queues supported: 4, Queues in use: 4
  Output traffic control profile: VUNI:SERVICE, Index: 49590

Interface-set: vuni-set2, Index: 2
Physical interface: ge-1/0/3, Index: 151
Queues supported: 4, Queues in use: 4
  Output traffic control profile: VUNI:SERVICE, Index: 49590
```

Meaning The operational mode command **show class-of-service interface-set** displays the two interface sets **vuni-set1** and **vuni-set2**. It also shows that the **VUNI:SERVICE** CoS policy is applied to both interface sets.

Verify Traffic Shaping and Scheduling Profiles

Purpose Verify traffic shaping and scheduling profiles on the router.

Action Use the following operational mode commands:

```
user@es4> show class-of-service traffic-control-profile
run show class-of-service traffic-control-profile
Traffic control profile: EVC:SERVICE, Index: 57589
  Shaping rate: 20000000
  Scheduler map: EVC

Traffic control profile: VUNI:SERVICE, Index: 49590
  Shaping rate: 100000000
  Scheduler map: EVC
  Guaranteed rate: 100000000
```

Meaning The operational mode command **show class-of-service traffic-control-profiles** shows that **eline1**, **elan1**, and **elan2** are subject to 100 Mbps shaping rate (see guaranteed rate). While 160 Mbps can ingress, only 100 Mbps can egress.

Verifying Schedulers and the Scheduler Map

Purpose Verify the schedulers and the scheduler map configured on router ES4.

Action Use the following operational mode command:

```
user@es4> show class-of-service scheduler-map EVC
Scheduler map: EVC, Index: 7810

  Scheduler: BE, Forwarding class: INET-BEST-EFFORT, Index: 2053
    Transmit rate: 30 percent, Rate Limit: none, Buffer size: 30 percent,
    Priority: low
    Excess Priority: unspecified
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    default-drop-profile
      Medium low      any             1    default-drop-profile
      Medium high     any             1    default-drop-profile
      High            any             1    default-drop-profile

  Scheduler: PD, Forwarding class: VPN-PR-DATA, Index: 2628
    Transmit rate: 40 percent, Rate Limit: none, Buffer size: 40 percent,
    Priority: high
    Excess Priority: unspecified
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    default-drop-profile
      Medium low      any             1    default-drop-profile
      Medium high     any             1    default-drop-profile
      High            any             1    default-drop-profile

  Scheduler: EF, Forwarding class: VOICE-EF, Index: 2278
    Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,
    Priority: strict-high
    Excess Priority: unspecified
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    default-drop-profile
      Medium low      any             1    default-drop-profile
      Medium high     any             1    default-drop-profile
      High            any             1    default-drop-profile
```

Meaning The operational mode command **show class-of-service scheduler-maps EVC** displays information about the schedulers **BE**, **PD**, and **EF** that are configured for scheduler map **EVC**. It also shows how each scheduler is tied to a forwarding class. Scheduler **BE** is tied to the forwarding class **INET-BEST-EFFORT**. Scheduler **PD** is tied to the forwarding class **VPN-PR-DATA**. Scheduler **EF** is tied to the forwarding class **VOICE-EF**.

Egress SLA Enforcement

Purpose Compare the queues for interface sets **vuni-set1** and **vuni-set2**. Dropped packets for either interface set indicates that bandwidth limits are being exceeded and enforcement is occurring.

Action Use the following operational mode command:

```
user@es4> show interfaces interface-set queue vuni-set1
Interface set: vuni-set1
  Interface set index: 1
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: INET-BEST-EFFORT
  Queued:
    Packets              :           2977942923                  8933 pps
    Bytes                :        1949099612484             100314048 bps
  Transmitted:
    Packets              :           1488278642                  4464 pps
    Bytes                :         973656736604              50139648 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :           1489660186                  4466 pps
     Low                 :           1489660186                  4466 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :         975440779240              50162112 bps
     Low                 :         975440779240              50162112 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 1, Forwarding classes: VPN-PR-DATA
  Queued:
    Packets              :           1231342961                  3576 pps
    Bytes                :         785429404088              40144224 bps
  Transmitted:
    Packets              :           1231342958                  3573 pps
    Bytes                :         785429402552              40131936 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 2, Forwarding classes: VOICE-EF
  Queued:
    Packets              :           1639301652                   893 pps
    Bytes                :         294440262416              10030176 bps
  Transmitted:
    Packets              :           1639301652                   893 pps
    Bytes                :         294440262416              10030176 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
```



```
Queue: 3, Forwarding classes: UNUSED
  Queued:
    Packets              :               3091521                     0 pps
    Bytes                :             222589512                     0 bps
  Transmitted:
    Packets              :               3091521                     0 pps
    Bytes                :             222589512                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low                 :                     0                     0 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low                 :                     0                     0 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
     High                :                     0                     0 bps

user@es4> show interfaces interface-set queue vuni-set2
Interface set: vuni-set2
  Interface set index: 2
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: INET-BEST-EFFORT
  Queued:
    Packets              :             513317220                  3572 pps
    Bytes                :          720697385280              40120704 bps
  Transmitted:
    Packets              :             513317220                  3572 pps
    Bytes                :          720697385280              40120704 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low                 :                     0                     0 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low                 :                     0                     0 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
     High                :                     0                     0 bps
Queue: 1, Forwarding classes: VPN-PR-DATA
  Queued:
    Packets              :             513317223                  3571 pps
    Bytes                :          720697376892              40109472 bps
  Transmitted:
    Packets              :             513317223                  3571 pps
    Bytes                :          720697376892              40109472 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low                 :                     0                     0 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low                 :                     0                     0 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
     High                :                     0                     0 bps
Queue: 2, Forwarding classes: VOICE-EF
  Queued:
```

```
    Packets             :          175354436                  893 pps
    Bytes               :       183560157444             10030176 bps
  Transmitted:
    Packets             :          175354436                  893 pps
    Bytes               :       183560157444             10030176 bps
    Tail-dropped packets :                 0                    0 pps
    RED-dropped packets  :                 0                    0 pps
     Low                :                  0                    0 pps
     Medium-low         :                  0                    0 pps
     Medium-high        :                  0                    0 pps
     High               :                  0                    0 pps
    RED-dropped bytes   :                  0                    0 bps
     Low                :                  0                    0 bps
     Medium-low         :                  0                    0 bps
     Medium-high        :                  0                    0 bps
     High               :                  0                    0 bps
Queue: 3, Forwarding classes: UNUSED
  Queued:
    Packets             :                  0                    0 pps
    Bytes               :                  0                    0 bps
  Transmitted:
    Packets             :                  0                    0 pps
    Bytes               :                  0                    0 bps
    Tail-dropped packets :                 0                    0 pps
    RED-dropped packets  :                 0                    0 pps
     Low                :                  0                    0 pps
     Medium-low         :                  0                    0 pps
     Medium-high        :                  0                    0 pps
     High               :                  0                    0 pps
    RED-dropped bytes   :                  0                    0 bps
     Low                :                  0                    0 bps
     Medium-low         :                  0                    0 bps
     Medium-high        :                  0                    0 bps
     High               :                  0                    0 bps
```

Meaning

The operational mode commands **show interfaces interface-set queue vuni-set1** and **show interfaces interface-set queue vuni-set2** show the queue statistics for the forwarding classes **INET-BEST-EFFORT**, **VPN-PR-DATA**, and **VOICE-EF**. See **Queue 2: Forwarding classes: VOICE-EF** in the output for command **show interfaces interface-set queue vuni-set1**. Notice that packets are being dropped for forwarding class **INET-BEST-EFFORT**. Queue 1 for forwarding class **VOICE-EF** and queue 2 for forwarding class **VPN-PR-DATA** are given a high priority during scheduling. Consequently, they do not have any dropped packets. Total traffic is shaped at 100 Mbps. After the 10 Mbps for voice traffic and the 40 Mbps for priority data is subtracted from the total bandwidth of 100 Mbps, 50 Mbps remains and is shared between the best-effort traffic for **eline1** and **eline2**. Excess best-effort traffic is dropped.

Related Documentation

- Understanding Junos COS Components for MX Series Routers on page 10
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers

Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability in service provider networks. Connectivity fault management (CFM) is used with PBB to support that carrier-class reliability. Use CFM to monitor, isolate, and verify faults in the network.

The Junos OS implementation of PBB supports the IEEE 802.1ah (PBB) and IEEE 802.1ag (CFM) standards.

This example describes how to configure end-to-end fault management in a PBN and a PBBN:

- Requirements on page 105
- Overview and Topology on page 105
- Configuring Connectivity Fault Management for a PBBN on page 109
- Configuring Connectivity Fault Management for a PBN on page 119
- Verification on page 127

Requirements

This example uses the following hardware and software components:

- Junos Release 10.0 or later for MX Series routers
- Eight MX Series routers in a PBB configuration

Before you configure the routers for PBB and services, be sure you have:

- Installed the MX Series router.
- Performed the initial router configuration.
- Performed the PBB configuration for Ethernet private line (E-LINE) and Ethernet transparent LAN (E-LAN) services. For more information, refer to ""Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers" on page 17".

Overview and Topology

There are two different networks that need to be configured for CFM in this example:

- A provider backbone bridge network (PBBN).
- Provider bridged networks (PBNs) that include PBN1, PBN2, and PBN3.

This example uses a series of maintenance end points (MEPs) and maintenance intermediate points (MIPs). MIPs respond to the OAM processes initiated by the MEPs. Using MEPs and MIPs, CFM provides end-to-end connectivity in the PBBN because it can exactly pinpoint a failure in the topology.

Figure 7 on page 106 displays the topology for the PBBN. The PBBN connect the PBNs and provides services to the PBNs. Two backbone core bridges (BCBs) are connected to PBN1, PBN2, and PBN3. Operation, Administration, and Maintenance (OAM) in the PBBN is limited to fault detection in the PBBN.

Figure 7: Network Topology for the PBBN

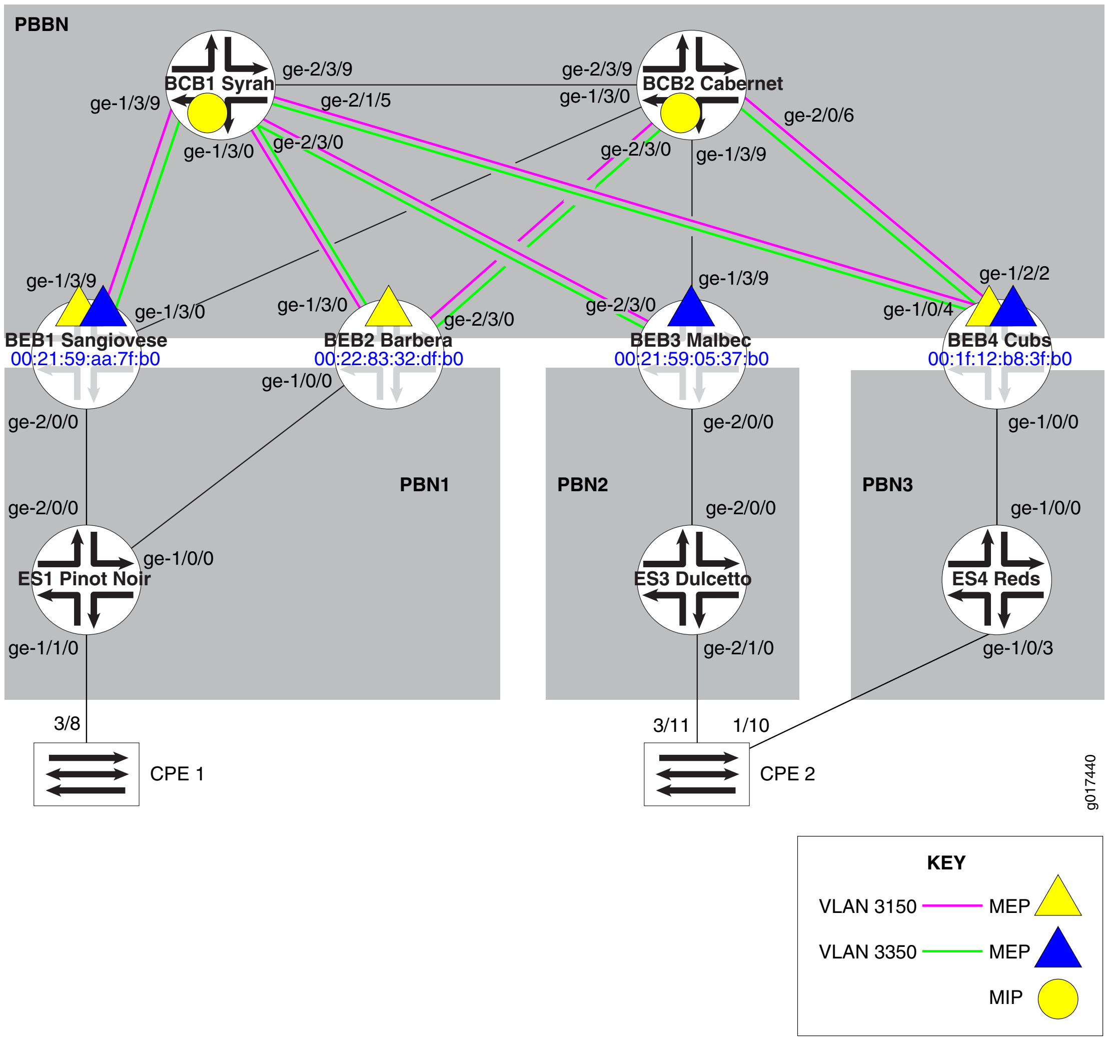


Table 12 on page 107 shows the maintenance end points (MEPs) and maintenance intermediate points (MIPs) that are configured for each router in the PBBN. The PBBN is configured with VLAN 3150 and 3350. CFM must be configured for monitoring the connectivity in both the VLANs. To do this, configure a MEP for each VLAN at the endpoints (BEBs), and configure a MIP for each VLAN on the core bridges (BCBs).

To configure a MIP for level *x*, the maintenance domain default-*x* is configured on the router. For example, if MEPs in the PBBN are configured at **level 3**, the MIP is configured as **default-3**.

NOTE: CFM in the PBBN is used to check the connectivity in the PBBN domain only, and packets are never leaked to the PBN.

Table 12: CFM Components Configured for the PBBN

VLAN	Router	Level	MEP	MIP
3150	**BEB1 (Sangiovese)**	5	100	—
	BEB2 (Barbera)	5	101	—
	BEB4 (Cubs)	5	102	—
	BCB1 (Syrah)	5	—	default-5
	BCB2 (Cabernet)	5	—	default-5
3350	**BEB1 (Sangiovese)**	5	100	—
	BEB3 (Malbec)	5	102	—
	BEB4 (Cubs)	5	102	—
	BCB1 (Syrah)	5	—	default-5
	BCB2 (Cabernet)	5	—	default-5

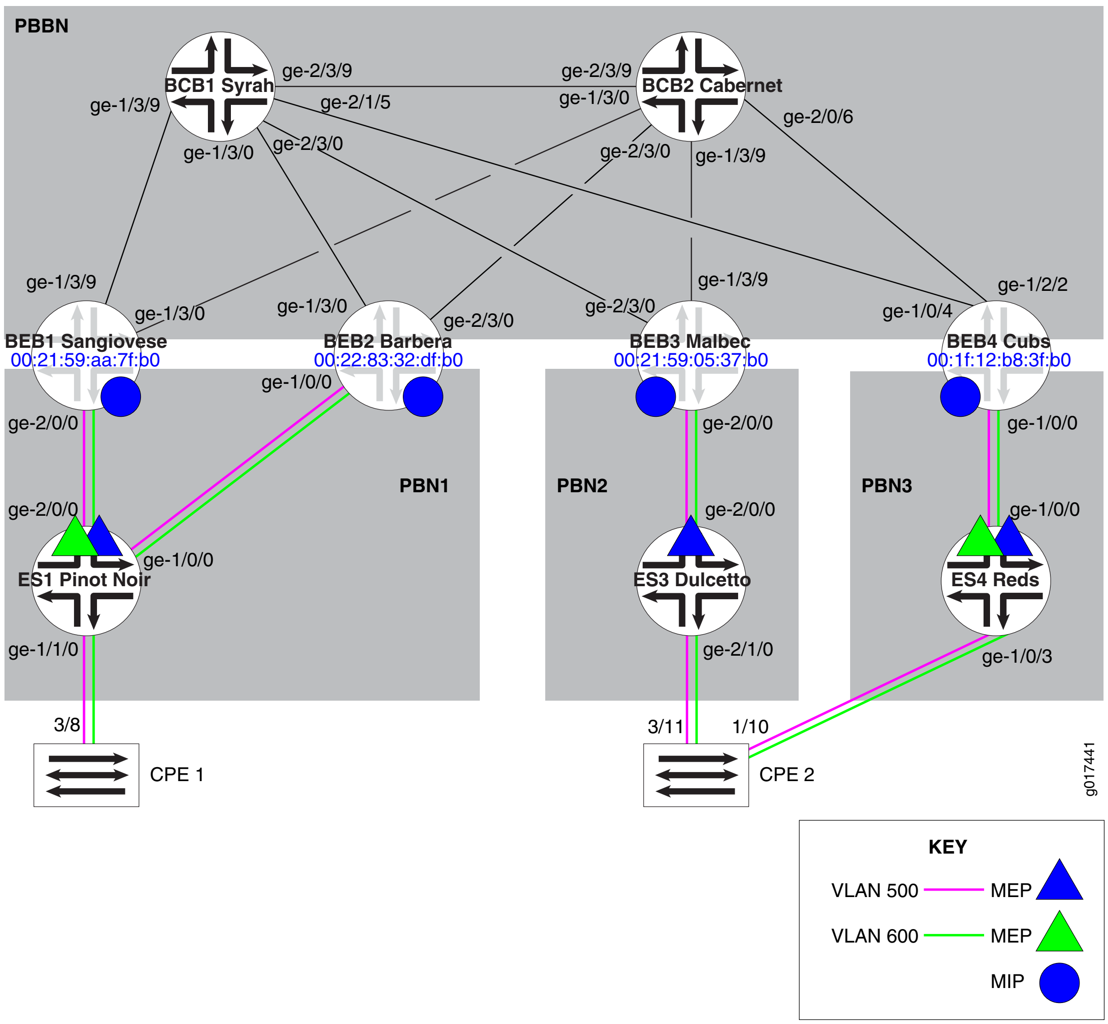
Figure 8 on page 108 displays the topology for PBN. BEB1, BEB2, BEB3, and BEB4 are connected to customer edge switches ES1, ES3, and ES4.

The PBN is configured with VLAN 500 and 600. CFM must be configured for monitoring the connectivity in both the VLANs. To do this, configure a MEP for each VLAN at the endpoints (ESs), and configure a MIP for each VLAN on the BEBs.

Comparing both topologies, notice that the BEBs are actually part of both the PBN and the PBBN. They perform the function of a MEP in the PBBN, but perform the function of a MIP in the PBN and participate in multiple maintenance domains. In comparison, BCBs in the PBBN participate in one maintenance domain and ESs in the PBN participate in one maintenance domain.

NOTE: CFM on the PBN is used to check the connectivity in the PBN domain—these packets are simply tunneled in the PBBN domain as data packets.

Figure 8: Network Topology for the PBN



[Table 13 on page 109](#) shows the MEPs and MIPs that are configured in the PBN.

Table 13: CFM Components Configured for the PBN

VLAN	Router	Level	MEP	MIP
500	**ES1 (Pinot Noir)**	3	1	—
	ES3 (Dolcetto)	3	2	—
	ES4 (Reds)	3	2	—
	BEB1 (Sangiovese)	3	—	default-3
	BEB2 (Barbera)	3	—	default-3
	BEB3 (Malbec)	3	—	default-3
	BEB4 (Cubs)	3	—	default-3
600	**ES1 (Pinot Noir)**	3	1	—
	ES4 (Reds)	3	2	—
	BEB1 (Sangiovese)	3	—	default-3
	BEB2 (Barbera)	3	—	default-3
	BEB3 (Malbec)	3	—	default-3
	BEB4 (Cubs)	3	—	default-3

NOTE: MX Series router ES3 (Dolcetto) is visible in the topology, but is not part of the CFM configuration example.

Configuring Connectivity Fault Management for a PBBN

To configure connectivity fault management on MX Series routers in a provider backbone bridge network, perform these tasks:

- Configuring a MEP on BEB1 (Sangiovese) on page 110
- Configuring a MEP on BEB2 (Barbera) on page 112
- Configuring a MEP on BEB3 (Malbec) on page 114
- Configuring a MEP on BEB4 (Cubs) on page 115
- Configuring a MIP on BCB1 (Syrah) on page 118
- Configuring a MIP on BCB2 (Cabernet) on page 118

Configuring a MEP on BEB1 (Sangiovese)

CLI Quick Configuration

To quickly configure a MEP for BEB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 interface vlan 3350
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 interface vlan 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 auto-discovery
```

Step-by-Step Procedure

To configure a MEP for BEB1:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is **pbbn**):

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn level 5
```

2. Configure the continuity check interval for the maintenance association (here, **vlan3350**). The continuity check protocol is used for fault detection by a Maintenance End Point (MEP). The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 continuity-check interval 1s
```

3. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, **vlan3150** and **pbbn**) and associate them to VLAN 3150 and the pseudo-logical interface **cbp0.0**).

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 interface vlan 3350
user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 interface cbp0.0
```

NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 direction up
   ```
5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 100 auto-discovery
   ```
6. Configure the continuity check interval for the maintenance association (here, **vlan3150**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 continuity-check interval 1s
   ```
7. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, **vlan3150** and **pbbn**).

   ```
   [edit protocols oam]
   user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 interface vlan 3350
   ```
8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 direction up
   ```
9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   NOTE: You can also use the command **remote-mep** to specify a remote MEP.

   ```
   [edit protocols oam]
   user@beb1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 100 auto-discovery
   ```

Results Check the results of the configuration:

```
user@beb1> show configuration
protocols {
  oam {
    ethernet {
      maintenance-domain pbbn {
        level 5;
        maintenance-association vlan3350 {
          continuity-check {
            interval 1s;
          }
          mep 100 {
            interface cbp0.0 vlan 3350;
            direction up;
            auto-discovery;
          }
        }
        maintenance-association vlan3150 {
          continuity-check {
            interval 1s;
          }
          mep 100 {
            interface cbp0.0 vlan 3150;
            direction up;
            auto-discovery;
          }
        }
      }
    }
  }
}
```

Configuring a MEP on BEB2 (Barbera)

CLI Quick Configuration

To quickly configure a MEP for BEB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 interface vlan 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 auto-discovery
```

Step-by-Step Procedure

To configure a MEP for BEB2:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is **pbbn**):

   ```
   [edit protocols oam]
   user@beb2# set protocols oam ethernet connectivity-fault-management
   maintenance-domain pbbn level 5
   ```
2. Configure the continuity check (CC) interval for the maintenance association (here, **vlan3150**). The continuity check protocol is used for fault detection by a MEP. The

MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 continuity-check interval 1s
```

3. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, **vlan3150** and **pbbn**) and associate them to VLAN 3150 and the pseudo-logical interface **cbp0.0**).

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 101 interface vlan 3150
user@beb2# set cfm-pbbn protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 101 interface cbp0.0
```

NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 101 direction up
```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 101 auto-discovery
```

Results Check the results of the configuration:

```
user@beb2> show configuration
protocols {
  oam {
    ethernet {
      maintenance-domain pbbn {
      level 5;
      maintenance-association vlan3150 {
        continuity-check {
          interval 1s;
        }
        mep 101 {
          interface cbp0.0 vlan 3150;
          direction up;
          auto-discovery;
        }
      }
```

```
      }
    }
  }
```

Configuring a MEP on BEB3 (Malbec)

CLI Quick Configuration

To quickly configure a MEP on BEB3, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn-elan level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn-elan maintenance-association vlan3350 mep 2 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn-elan maintenance-association vlan3350 mep 2 interface vlan 3350
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn-elan maintenance-association vlan3350 mep 2 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn-elan maintenance-association vlan3350 mep 2 auto-discovery
```

Step-by-Step Procedure

To configure a MEP on BEB3:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is **pbbn-elan**):

   ```
   [edit groups]
   user@beb3# set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn-elan level 5
   ```

2. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, **vlan3350** and **pbbn-elan** and associate them to VLAN 3150 and the pseudo-logical interface **cbp0.0**.

   ```
   [edit protocols oam]
   user@beb3# set ethernet connectivity-fault-management maintenance-domain pbbn-elan maintenance-association vlan3350 mep 102 interface vlan 3350
   user@beb3# set ethernet connectivity-fault-management maintenance-domain pbbn-elan maintenance-association vlan3350 mep 101 interface cbp0.0
   ```

   NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

3. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@beb3# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 101 direction up
   ```

4. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   ```

user@beb3# **set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 101** auto-discovery

Results Check the results of the configuration:

```
user@beb3> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain pbbn-elan {
          level 5;
          maintenance-association vlan3350 {
          }
          mep 102 {
            interface cbp0.0 vlan 3350;
            direction up;
            auto-discovery;
          }
        }
      }
    }
  }
}
```

Configuring a MEP on BEB4 (Cubs)

CLI Quick Configuration To quickly configure a MEP for BEB4, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 interface vlan 3350
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 102 interface vlan 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 102 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 102 auto-discovery
```


Step-by-Step Procedure

To configure a MEP for BEB4:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is **pbbn**):

   ```
   [edit protocols oam]
   user@beb4# set ethernet connectivity-fault-management maintenance-domain pbbn level 5
   ```

2. Configure the continuity check interval for the maintenance association (here, **vlan3350**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@beb4# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 continuity-check interval 1s
   ```

3. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, **vlan3150** and **pbbn**) and associate them to VLAN 3150 and the pseudo-logical interface **cbp0.0**.

   ```
   [edit protocols oam]
   user@beb4# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 interface vlan 3350
   user@beb4# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 interface cbp0.0
   ```

   NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@beb4# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 direction up
   ```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   user@beb4# set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3350 mep 102 auto-discovery
   ```

6. Configure the continuity check interval for the maintenance association (here, **vlan3150**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@beb4# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 continuity-check interval 1s
   ```

7. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, **vlan3150** and **pbbn**).

   [edit protocols oam]
   user@beb4# **set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 102 interface vlan 3150**

8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   [edit protocols oam]
   user@beb4# **set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 102 direction up**

9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   [edit protocols oam]
   user@beb4# **set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association vlan3150 mep 102 auto-discovery**

Results Check the results of the configuration:

```
user@beb4> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain pbbn {
          level 5;
          maintenance-association vlan3350 {
            continuity-check {
              interval 1s;
            }
            mep 102 {
              interface cbp0.0 vlan 3350;
              direction up;
              auto-discovery;
            }
          }
          maintenance-association vlan3150 {
            continuity-check {
              interval 1s;
            }
            mep 102 {
              interface cbp0.0 vlan 3150;
              direction up;
              auto-discovery;
            }
          }
        }
      }
    }
  }
}
```

Configuring a MIP on BCB1 (Syrah)

CLI Quick Configuration

To quickly configure a MIP for BCB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain default-5
virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain default-5
mip-half-function default
```

Step-by-Step Procedure

To configure a MIP for BCB1:

1. Configure a maintenance domain **default-5** and the bridge domain **eline-bvlan** and associate them to VLAN ID **3150**.

   ```
   [edit protocols oam]
   user@bcb1# set ethernet connectivity-fault-management maintenance-domain default-5
   virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
   ```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

   ```
   [edit protocols oam]
   user@bcb1# ethernet connectivity-fault-management maintenance-domain default-5
   mip-half-function default
   ```

   NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the **mip-half-function** value for all MDs and MAs be the same.

Results

Check the results of the configuration:

```
user@bcb1> show configuration
protocols {
  oam {
    ethernet {
        maintenance-domain default-5 {
          virtual-switch pbbn-1 bridge-domain{
          }
          mip-half-function default;
        }
      }
    }
  }
}
```

Configuring a MIP on BCB2 (Cabernet)

CLI Quick Configuration

To quickly configure a MIP for BCB2, copy the following commands and paste them into the router terminal window:

```
[edit]
```

set protocols oam ethernet connectivity-fault-management maintenance-domain default-5 virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain default-5 mip-half-function default

Step-by-Step Procedure

To configure a MIP for BCB2:

1. Configure maintenance domain **default-5** and the bridge domain **eline-bvlan** and associate them to VLAN ID **3150**.

   ```
   [edit protocols oam]
   user@bcb2# set ethernet connectivity-fault-management maintenance-domain default-5 virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
   ```
2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

   ```
   [edit protocols oam]
   user@bcb2# ethernet connectivity-fault-management maintenance-domain default-5 mip-half-function default
   ```

NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the **mip-half-function** value for all MDs and MAs be the same.

Results

Check the results of the configuration:

```
user@bcb2> show configuration
protocols {
  oam {
    ethernet {
        maintenance-domain default-5 {
          virtual-switch pbbn-1 bridge-domain{
          }
          mip-half-function default;
        }
      }
    }
  }
}
```

Configuring Connectivity Fault Management for a PBN

To configure connectivity fault management on MX Series routers in a PBN, perform these tasks:

- Configuring a MIP on BEB1 (Sangiovese) on page 120
- Configuring a MIP on BEB2 (Barbera) on page 121
- Configuring a MIP on BEB4 (Cubs) on page 122
- Configuring a MEP on ES1 (Pinot Noir) on page 123
- Configuring a MEP on ES4 (Reds) on page 125

Configuring a MIP on BEB1 (Sangiovese)

CLI Quick Configuration

To quickly configure a MIP for BEB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 1200
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 2100
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3
mip-half-function default
```

Step-by-Step Procedure

To configure a MIP for BEB1:

1. To enable CFM at the B-VLAN level, specify the B-VLAN routing instance name, the B-VLAN ID, and the service group (here, the routing instance is **pbn-1-for-eline**, the B-VLAN IDs are **1200** and **2100**, and the service group is **eline-svlans**):

   ```
   [edit protocols oam ethernet connectivity-fault-management]
   set maintenance-domain default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans
   vlan-id 1200
   set maintenance-domain default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans
   vlan-id 2100
   ```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

   ```
   [edit protocols oam ethernet connectivity-fault-management]
   user@beb1# maintenance-domain default-3 mip-half-function default
   ```

NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the **mip-half-function** value for all MDs and MAs be the same.

Results

Check the results of the configuration:

```
user@beb1> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain default-3 {
          virtual-switch pbn-1-for-eline {
            bridge-domain eline-svlans vlan-id [ 1200 2100 ];
          }
          mip-half-function default;
        }
      }
    }
  }
}
```


Configuring a MIP on BEB2 (Barbera)

CLI Quick Configuration

To quickly configure a MIP for BEB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 1200
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 2100
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3 mip-half-function default
```

Step-by-Step Procedure

To configure a MIP for BEB2:

1. Create a MIP for the PBN (here, at level **default-3**):

   ```
   [edit protocols oam ]
   set ethernet connectivity-fault-management maintenance-domain default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 1200
   set maintenance-domain default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 2100
   ```
2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

   ```
   [edit protocols oam ]
   user@beb2# ethernet connectivity-fault-management maintenance-domain default-3 mip-half-function default
   ```

NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple MDs or MAs, it is essential that the **mip-half-function** value for all MDs and MAs be the same.

Results

Check the results of the configuration:

```
user@beb2> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain default-3 {
          virtual-switch pbn-1-for-eline {
            bridge-domain eline-svlans vlan-id [ 1200 2100 ];
          }
          mip-half-function default;
        }
      }
    }
  }
}
```

Configuring a MIP on BEB4 (Cubs)

CLI Quick Configuration

To quickly configure a MIP for BEB4, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-3-for-eline bridge-domain eline-svlans vlan-id 1200
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-3-for-eline bridge-domain eline-svlans vlan-id 2100
set protocols oam ethernet connectivity-fault-management maintenance-domain default-3
mip-half-function default
```

Step-by-Step Procedure

To configure a MIP for BEB4:

1. To enable CFM at the B-VLAN level, specify the B-VLAN routing instance name, the B-VLAN ID, and the service group (here, the routing instance is **pbn-3-for-eline** the B-VLAN IDs are **1200** and **2100**, and the service group is **eline-svlans**):

   ```
   [edit protocols oam]
   set ethernet connectivity-fault-management maintenance-domain default-3 virtual-switch
   pbn-3-for-eline bridge-domain eline-svlans vlan-id 1200
   set ethernet connectivity-fault-management maintenance-domain default-3 virtual-switch
   pbn-3-for-eline bridge-domain eline-svlans vlan-id 2100
   ```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

   ```
   [edit protocols oam ]
   user@beb4# ethernet connectivity-fault-management maintenance-domain default-3
   mip-half-function default
   ```

NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the **mip-half-function** value for all MDs and MAs be the same.

Results

Check the results of the configuration:

```
user@beb4> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain default-3 {
          virtual-switch pbn-3-for-eline {
            bridge-domain eline-svlans vlan-id [ 1200 2100 ];
          }
          mip-half-function default;
        }
      }
    }
  }
}
```


Configuring a MEP on ES1 (Pinot Noir)

CLI Quick Configuration

To quickly configure a MEP for ES1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet ethernet connectivity-fault-management maintenance-domain es-domain level 3
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 interface ge-1/1/0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 interface vlan 500
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 interface ge-1/1/0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 interface vlan 600
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 auto-discovery
```

Step-by-Step Procedure

To configure a MEP for ES1:

1. Configure the maintenance domain **es-domain**, a mandatory parameter that indicates the nesting relationship between various maintenance domains and is embedded in each of the CFM frames:

   ```
   [edit protocols oam]
   user@es1# set protocols oam ethernet ethernet connectivity-fault-management maintenance-domain es-domain level 3
   ```

2. Configure the continuity check interval for the maintenance association (here, **vlan3350**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@es1# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1continuity-check interval 1s
   ```

3. Configure a MEP with the same maintenance domain and maintenance association identifier (here, **es-domain** and **eline-1**) and associate them to VLAN 500 and the pseudo-logical interface **ge-1/1/0.0**.

   ```
   [edit protocols oam]
   user@es1# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 interface ge-1/1/0.0
   user@es1# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 interface vlan 500
   ```


4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@es1# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 1 direction up
   ```
5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   user@es1# set ethernet connectivity-fault-management maintenance-domain pbbn maintenance-association eline-1 mep 1 auto-discovery
   ```
6. Configure the continuity check interval for the maintenance association (here, **vlan3150**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@es1# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 continuity-check interval 1s
   ```
7. Configure a MEP with the same maintenance domain and maintenance association identifier (here, **es-domain** and **eline-2**) and associate them to VLAN 500 and the pseudo-logical interface **ge-1/0/3.6**.

   ```
   [edit protocols oam]
   user@es1# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 interface ge-1/1/0.0
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 interface vlan 600
   ```
8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 direction up
   ```
9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 1 auto-discovery
   ```

Results Check the results of the configuration:

```
user@es1> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain es-domain {
          level 3;
          maintenance-association eline-1 {
            continuity-check {
              interval 1s;
```



```
                }
                mep 1 {
                    interface ge-1/1/0.0 vlan 500;
                    direction up;
                    auto-discovery;
                }
            }
            maintenance-association eline-2 {
                continuity-check {
                    interval 1s;
                }
                mep 1 {
                    interface ge-1/1/0.0 vlan 600;
                    direction up;
                    auto-discovery;
                }
            }
        }
    }
}
}
}
```

Configuring a MEP on ES4 (Reds)

CLI Quick Configuration

To quickly configure OAM for ES4, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet ethernet connectivity-fault-management maintenance-domain es-domain level 3
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 2 interface ge-1/0/3.5
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 2 interface vlan 500
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 2 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-1 mep 2 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 2 interface ge-1/0/3.6
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 2 interface vlan 600
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 2 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 2 auto-discovery
```

Step-by-Step Procedure

To configure a MEP for ES4:

1. Configure the maintenance domain **es-domain**, a mandatory parameter that indicates the nesting relationship between various maintenance domains and is embedded in each of the CFM frames:

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain
   level 3
   ```

2. Configure the continuity check interval for the maintenance association (here, **vlan3350**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain
   maintenance-association eline-1continuity-check interval 1s
   ```

3. Configure a MEP with the same maintenance domain and maintenance association identifier (here, **es-domain** and **eline-1**) and associate them to VLAN 500 and the pseudo-logical interface **ge-1/0/3.5**.

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain
   maintenance-association eline-1 mep 2 interface ge-1/0/3.5
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain
   maintenance-association eline-1 mep 2 interface vlan 500
   ```

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   user@es4# ethernet connectivity-fault-management maintenance-domain es-domain
   maintenance-association eline-1 mep 2 direction up
   ```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain pbbn
   maintenance-association eline-1 mep 2 auto-discovery
   ```

6. Configure the continuity check interval for the maintenance association (here, **vlan3150**). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain
   maintenance-association eline-2 continuity-check interval 1s
   ```

7. Configure a MEP with the same maintenance domain and maintenance association identifier (here, **es-domain** and **eline-2**) and associate them to VLAN 500 and the pseudo-logical interface **ge-1/0/3.6**.

   ```
   [edit protocols oam]
   user@es4# set ethernet connectivity-fault-management maintenance-domain es-domain
   maintenance-association eline-2 mep 2 interface ge-1/0/3.6
   ```

user@es4# **set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2** mep **2 interface vlan 600**

8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

   ```
   [edit protocols oam]
   ```
   user@es4# **set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 2** direction **up**

9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

   ```
   [edit protocols oam]
   ```
   user@es4# **set ethernet connectivity-fault-management maintenance-domain es-domain maintenance-association eline-2 mep 2** auto-discovery

Results Check the results of the configuration:

```
user@es4> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain es-domain {
          level 3;
          maintenance-association eline-1 {
            continuity-check {
              interval 1s;
            }
            mep 2 {
              interface ge-1/0/3.5 vlan 500;
              direction up;
              auto-discovery;
            }
          }
          maintenance-association eline-2 {
            continuity-check {
              interval 1s;
            }
            mep 2 {
              interface ge-1/0/3.6 vlan 600;
              direction up;
              auto-discovery;
            }
          }
        }
      }
    }
  }
}
```

Verification

To confirm that the configuration is working properly on each router in the PBBN and PBN:

- Verify that the CC protocol is **UP** for VLAN 3150 and VLAN 3350 (in the PBBN) and VLAN 500 and VLAN 600 (in the PBN). The MEP should be able to discover remote MEPs in each VLAN.
- Verify the path between a pair of MEPs using the Linktrace protocol. The MIPs should respond to linktrace messages.

To confirm that the configuration is working properly, perform these tasks:

- Verifying CFM on VLAN 3150 in the PBBN on page 128
- Verifying CFM for VLAN 3350 in the PBBN on page 133
- Verifying CFM for VLAN 500 in the PBN on page 136
- Verifying CFM for VLAN 600 in the PBN on page 141

Verifying CFM on VLAN 3150 in the PBBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN-3150 using the maintenance domain **pbbn** and the maintenance association **vlan3150** level-5 for OAM monitoring:

- BEB1 (Sangiovese) MEP-100
- BEB2 (Barbera) MEP-101
- BEB4 (Cubs) MEP-102
- BCB1 (Syrah) MIP
- BCB2 (Cabernet) MIP

Action For BEB1:

Use the following operational mode command on BEB1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@beb1> show oam ethernet connectivity-fault-management mep-database
maintenance-domain pbbn maintenance-association vlan3150
Interface name: cbp0.0, vlan 3150, Interface status: Active, Link status: Up
  Maintenance domain name: pbbn, Format: string, Level: 5
    Maintenance association name: vlan3150, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 100, Direction: up, MAC address: 00:21:59:aa:78:11
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                : no
      Erroneous CCM received                      : no
      Cross-connect CCM received                  : no
      RDI sent by some MEP                        : no
      Some remote MEP's MAC in error state        : no
    Statistics:
      CCMs sent                                   : 14670
      CCMs received out of sequence               : 0
      LBMs sent                                   : 0
      Valid in-order LBRs received                : 0
      Valid out-of-order LBRs received            : 0
      LBRs received with corrupted data           : 0
      LBRs sent                                   : 0
      LTMs sent                                   : 5
      LTMs received                               : 0
      LTRs sent                                   : 0
      LTRs received                               : 10
      Sequence number of next LTM request         : 5
      1DMs sent                                   : 0
      Valid 1DMs received                         : 0
      Invalid 1DMs received                       : 0
      Out of sync 1DMs received                   : 0
      DMMs sent                                   : 0
      Valid DMMs received                         : 0
      Invalid DMMs received                       : 0
      DMRs sent                                   : 0
      Valid DMRs received                         : 0
      Invalid DMRs received                       : 0
    Remote MEP count: 2
      Identifier    MAC address        State    Interface
        101     00:22:83:32:d8:11       ok    ge-1/3/9.0
        102     00:1f:12:b8:38:11       ok    ge-1/3/9.0
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb1> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:22:83:32:d8:11

  Linktrace to 00:22:83:32:d8:11, Interface : ge-1/3/9.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3150, Local Mep: 100
      Transaction Identifier: 5
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:74:8d         00:21:59:aa:74:84
```



```
  2    61    00:22:83:32:d8:11        00:00:00:00:00:00
```

user@beb1> traceroute ethernet **maintenance-domain pbbn maintenance-association vlan3150 00:21:59:aa:74:8d**

```
   Linktrace to 00:1f:12:b8:38:11, Interface : ge-1/3/9.0
     Maintenance Domain: pbbn, Level: 5
     Maintenance Association: vlan3150, Local Mep: 100
     Transaction Identifier: 6
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:74:8d         00:21:59:aa:75:d4
    2     61     00:1f:12:b8:38:11         00:00:00:00:00:00
```

For BEB2:

Use the following operational mode command on BEB2 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

user@beb2> show oam ethernet connectivity-fault-management mep-database **maintenance-domain pbbn maintenance-association vlan3150**

```
Interface name: cbp0.0, vlan 3150, Interface status: Active, Link status: Up
  Maintenance domain name: pbbn, Format: string, Level: 5
    Maintenance association name: vlan3150, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 101, Direction: up, MAC address: 00:22:83:32:d8:11
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                : no
      Erroneous CCM received                      : no
      Cross-connect CCM received                  : no
      RDI sent by some MEP                        : no
      Some remote MEP's MAC in error state        : no
    Statistics:
      CCMs sent                                   : 6021
      CCMs received out of sequence               : 0
      LBMs sent                                   : 0
      Valid in-order LBRs received                : 0
      Valid out-of-order LBRs received            : 0
      LBRs received with corrupted data           : 0
      LBRs sent                                   : 0
      LTMs sent                                   : 1
      LTMs received                               : 4
      LTRs sent                                   : 4
      LTRs received                               : 2
      Sequence number of next LTM request         : 1
      1DMs sent                                   : 0
      Valid 1DMs received                         : 0
      Invalid 1DMs received                       : 0
      Out of sync 1DMs received                   : 0
      DMMs sent                                   : 0
      Valid DMMs received                         : 0
      Invalid DMMs received                       : 0
      DMRs sent                                   : 0
      Valid DMRs received                         : 0
      Invalid DMRs received                       : 0
    Remote MEP count: 2
      Identifier     MAC address        State    Interface
```



```
100     00:21:59:aa:78:11       ok     ge-1/3/0.0
102     00:1f:12:b8:38:11       ok     ge-1/3/0.0
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb2> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:21:59:aa:78:11
Linktrace to 00:21:59:aa:78:11, Interface : ge-1/3/0.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3150, Local Mep: 101
      Transaction Identifier: 1
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:74:84         00:21:59:aa:74:8d
    2     61     00:21:59:aa:78:11         00:00:00:00:00:00
```

```
user@beb2> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:1f:12:b8:38:11
Linktrace to 00:1f:12:b8:38:11, Interface : ge-1/3/0.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3150, Local Mep: 101
      Transaction Identifier: 2
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:74:84         00:21:59:aa:75:d4
    2     61     00:1f:12:b8:38:11         00:00:00:00:00:00
```

For BEB4:

Use the following operational mode command on BEB4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@beb4> show oam ethernet connectivity-fault-management mep-database
maintenance-domain pbbn maintenance-association vlan3150
Interface name: cbp0.0, vlan 3150, Interface status: Active, Link status: Up
  Maintenance domain name: pbbn, Format: string, Level: 5
    Maintenance association name: vlan3150, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 102, Direction: up, MAC address: 00:1f:12:b8:38:11
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                    : no
      Erroneous CCM received                          : no
      Cross-connect CCM received                      : no
      RDI sent by some MEP                            : no
      Some remote MEP's MAC in error state            : no
    Statistics:
      CCMs sent                                       : 7507
      CCMs received out of sequence                   : 0
      LBMs sent                                       : 0
      Valid in-order LBRs received                    : 0
      Valid out-of-order LBRs received                : 0
      LBRs received with corrupted data               : 0
      LBRs sent                                       : 0
      LTMs sent                                       : 1
      LTMs received                                   : 6
      LTRs sent                                       : 6
      LTRs received                                   : 2
```



```
      Sequence number of next LTM request          : 1
      1DMs sent                                    : 0
      Valid 1DMs received                          : 0
      Invalid 1DMs received                        : 0
      Out of sync 1DMs received                    : 0
      DMMs sent                                    : 0
      Valid DMMs received                          : 0
      Invalid DMMs received                        : 0
      DMRs sent                                    : 0
      Valid DMRs received                          : 0
      Invalid DMRs received                        : 0
    Remote MEP count: 2
      Identifier     MAC address        State    Interface
        100      00:21:59:aa:78:11       ok     ge-1/0/4.0
        101      00:22:83:32:d8:11       ok     ge-1/0/4.0
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb4> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150 00:21:59:aa:78:11
Linktrace to 00:21:59:aa:78:11, Interface : ge-1/0/4.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3150, Local Mep: 102
      Transaction Identifier: 1
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:75:d4         00:21:59:aa:74:8d
    2     61     00:21:59:aa:78:11         00:00:00:00:00:00
```

```
user@beb4> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150 00:22:83:32:d8:11
Linktrace to 00:22:83:32:d8:11, Interface : ge-1/0/4.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3150, Local Mep: 102
      Transaction Identifier: 2
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:75:d4         00:21:59:aa:74:84
    2     61     00:22:83:32:d8:11         00:00:00:00:00:00
```

For BCB1:

Use the following operational mode command on BCB1 to verify the MIP status:

```
user@bcb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
  maintenance-domain mhf          : unspecified
  maintenance-association mhf     : unspecified
  default maintenance-domain mhf    : default

  Interface        Level
  ge-2/1/5.0          5
  ge-2/3/0.0          5
  ge-2/3/9.0          5
  ge-1/3/0.0          5
  ge-1/3/9.0          5
```

For BCB2:

Use the following operational mode command on BCB2 to verify the MIP status:

```
user@bcb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  ge-2/0/6.0          5
  ge-1/3/0.0          5
  ge-1/3/9.0          5
  ge-2/3/0.0          5
  ge-2/3/9.0          5
```

Meaning The command **show oam ethernet connectivity-fault-management interfaces mep-database** displays the CFM connectivity status per service. When used with the maintenance association **vlan3150**, it displays the source MAC addresses for the **Remote MEPs** at the bottom of the output. Use the MAC addresses shown in the **Remote MEPs** section along with the maintenance association to issue the **traceroute ethernet** command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command **show oam ethernet connectivity-fault-management mip** displays all the MIPs created in the system.

Verifying CFM for VLAN 3350 in the PBBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN 3350 using the maintenance domain **pbbn** and the maintenance association **vlan3350** level-5 for OAM monitoring:

- BEB1 (Sangiovese) MEP-100
- BEB4 (Cubs) MEP-102
- BCB1 (Syrah) MIP
- BCB2 (Cabernet) MIP

Action For BEB1:

Use the following operational mode command on BEB1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@beb1> show oam ethernet connectivity-fault-management mep-database
maintenance-domain pbbn maintenance-association vlan3350
Interface name: cbp0.0, vlan 3350, Interface status: Active, Link status: Up
  Maintenance domain name: pbbn, Format: string, Level: 5
    Maintenance association name: vlan3350, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 100, Direction: up, MAC address: 00:21:59:aa:78:11
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                : no
      Erroneous CCM received                      : no
      Cross-connect CCM received                  : no
      RDI sent by some MEP                        : no
      Some remote MEP's MAC in error state        : no
    Statistics:
      CCMs sent                                   : 14666
      CCMs received out of sequence               : 0
      LBMs sent                                   : 0
      Valid in-order LBRs received                : 0
      Valid out-of-order LBRs received            : 0
      LBRs received with corrupted data           : 0
      LBRs sent                                   : 0
      LTMs sent                                   : 2
      LTMs received                               : 0
      LTRs sent                                   : 0
      LTRs received                               : 2
      Sequence number of next LTM request         : 2
      1DMs sent                                   : 0
      Valid 1DMs received                         : 0
      Invalid 1DMs received                       : 0
      Out of sync 1DMs received                   : 0
      DMMs sent                                   : 0
      Valid DMMs received                         : 0
      Invalid DMMs received                       : 0
      DMRs sent                                   : 0
      Valid DMRs received                         : 0
      Invalid DMRs received                       : 0
    Remote MEP count: 1
      Identifier     MAC address        State    Interface
        102      00:1f:12:b8:38:11       ok    ge-1/3/9.0
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb1> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3350
00:1f:12:b8:38:11
Linktrace to 00:1f:12:b8:38:11, Interface : ge-1/3/9.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3350, Local Mep: 100
      Transaction Identifier: 2
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:1f:12:b8:38:11         00:00:00:00:00:00
```


For BEB4:

Use the following operational mode command on BEB4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@beb4> show oam ethernet connectivity-fault-management mep-database
maintenance-domain pbbn maintenance-association vlan3350
Interface name: cbp0.0, vlan 3350, Interface status: Active, Link status: Up
  Maintenance domain name: pbbn, Format: string, Level: 5
    Maintenance association name: vlan3350, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 102, Direction: up, MAC address: 00:1f:12:b8:38:11
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                  : no
      Erroneous CCM received                        : no
      Cross-connect CCM received                    : no
      RDI sent by some MEP                          : no
      Some remote MEP's MAC in error state          : no
    Statistics:
      CCMs sent                                     : 7507
      CCMs received out of sequence                 : 0
      LBMs sent                                     : 0
      Valid in-order LBRs received                  : 0
      Valid out-of-order LBRs received              : 0
      LBRs received with corrupted data             : 0
      LBRs sent                                     : 0
      LTMs sent                                     : 0
      LTMs received                                 : 3
      LTRs sent                                     : 3
      LTRs received                                 : 0
      Sequence number of next LTM request           : 0
      1DMs sent                                     : 0
      Valid 1DMs received                           : 0
      Invalid 1DMs received                         : 0
      Out of sync 1DMs received                     : 0
      DMMs sent                                     : 0
      Valid DMMs received                           : 0
      Invalid DMMs received                         : 0
      DMRs sent                                     : 0
      Valid DMRs received                           : 0
      Invalid DMRs received                         : 0
    Remote MEP count: 1
      Identifier     MAC address        State    Interface
        100      00:21:59:aa:78:11       ok    ge-1/0/4.0
```

Perform a linktrace to the remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb4> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3350
00:21:59:aa:78:11
Linktrace to 00:21:59:aa:78:11, Interface : ge-1/0/4.0
      Maintenance Domain: pbbn, Level: 5
      Maintenance Association: vlan3350, Local Mep: 102
      Transaction Identifier: 0
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     62     00:21:59:aa:78:11         00:00:00:00:00:00
```

For BCB1:

Use the following operational mode command on BCB1 to verify the MIP status:

```
user@bcb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
  maintenance-domain mhf           : unspecified
  maintenance-association mhf      : unspecified
  default maintenance-domain mhf   : default

  Interface       Level
  ge-2/1/5.0          5
  ge-2/3/0.0          5
  ge-2/3/9.0          5
  ge-1/3/0.0          5
  ge-1/3/9.0          5
```

For BCB2:

Use the following operational mode command on BCB2 to verify the MIP status:

```
user@bcb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
  maintenance-domain mhf           : unspecified
  maintenance-association mhf      : unspecified
  default maintenance-domain mhf   : default

  Interface       Level
  ge-2/0/6.0          5
  ge-1/3/0.0          5
  ge-1/3/9.0          5
  ge-2/3/0.0          5
  ge-2/3/9.0          5
```

Meaning The command **show oam ethernet connectivity-fault-management interfaces mep-database** displays the CFM connectivity status per service. When used with the maintenance association **vlan3350**, it displays the source MAC addresses for the **Remote MEPs** at the bottom of the output. Use the MAC addresses shown in the **Remote MEPs** section along with the maintenance association to issue the **traceroute ethernet** command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command **show oam ethernet connectivity-fault-management mip** displays all the MIPs created in the system.

Verifying CFM for VLAN 500 in the PBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN 500 using the maintenance domain **es-domain** and the maintenance association **eline-1** at level-3 for OAM monitoring:

- ES1 (Pinot Noir) MEP-1
- ES4 (Reds) MEP-2
- BEB1 (Sangiovese) MIP

- BEB2 (Barbera) MIP
- BEB4 (Cubs) MIP

Action For ES1:

Use the following operational mode command on ES1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@es1> show oam ethernet connectivity-fault-management mep-database
maintenance-domain es-domain maintenance-association eline-1
Interface name: ge-1/1/0.0, vlan 500, Interface status: Active, Link status: Up
  Maintenance domain name: es-domain, Format: string, Level: 3
    Maintenance association name: eline-1, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 1, Direction: up, MAC address: 00:21:59:01:e3:3a
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                 : no
      Erroneous CCM received                       : no
      Cross-connect CCM received                   : no
      RDI sent by some MEP                         : no
      Some remote MEP's MAC in error state         : no
    Statistics:
      CCMs sent                                    : 29310
      CCMs received out of sequence                : 0
      LBMs sent                                    : 0
      Valid in-order LBRs received                 : 0
      Valid out-of-order LBRs received             : 0
      LBRs received with corrupted data            : 0
      LBRs sent                                    : 0
      LTMs sent                                    : 3
      LTMs received                                : 2
      LTRs sent                                    : 2
      LTRs received                                : 9
      Sequence number of next LTM request          : 3
      1DMs sent                                    : 0
      Valid 1DMs received                          : 0
      Invalid 1DMs received                        : 0
      Out of sync 1DMs received                    : 0
      DMMs sent                                    : 0
      Valid DMMs received                          : 0
      Invalid DMMs received                        : 0
      DMRs sent                                    : 0
      Valid DMRs received                          : 0
      Invalid DMRs received                        : 0
    Remote MEP count: 1
      Identifier    MAC address        State    Interface
          2     00:1f:12:b8:72:98       ok    ge-2/0/0.1
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@es1> traceroute ethernet maintenance-domain pbbn maintenance-association eline-1
mep2
Linktrace to 00:1f:12:b8:72:98, Interface : ge-2/0/0.1
      Maintenance Domain: es-domain, Level: 3
      Maintenance Association: eline-1, Local Mep: 1
      Transaction Identifier: 1
    Hop   TTL    Source MAC address         Next-hop MAC address
    .
    1     60     00:1f:12:b8:72:98          00:00:00:00:00:00
    2     61     00:1f:12:b8:3f:b0          00:1f:12:b8:3a:95
```



```
    3     62     00:21:59:aa:7d:2a         00:21:59:aa:7f:b0
```

For ES4:

Use the following operational mode command on ES4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@es4> show oam ethernet connectivity-fault-management mep-database
maintenance-domain es-domain maintenance-association eline-1
Interface name: ge-1/0/3.5, vlan 500, Interface status: Active, Link status: Up
  Maintenance domain name: es-domain, Format: string, Level: 3
    Maintenance association name: eline-1, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 2, Direction: up, MAC address: 00:1f:12:b8:72:98
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                  : no
      Erroneous CCM received                        : no
      Cross-connect CCM received                    : no
      RDI sent by some MEP                          : no
      Some remote MEP's MAC in error state          : no
    Statistics:
      CCMs sent                                     : 8133
      CCMs received out of sequence                 : 0
      LBMs sent                                     : 8
      Valid in-order LBRs received                  : 0
      Valid out-of-order LBRs received              : 0
      LBRs received with corrupted data             : 0
      LBRs sent                                     : 0
      LTMs sent                                     : 4
      LTMs received                                 : 0
      LTRs sent                                     : 0
      LTRs received                                 : 8
      Sequence number of next LTM request           : 4
      1DMs sent                                     : 0
      Valid 1DMs received                           : 0
      Invalid 1DMs received                         : 0
      Out of sync 1DMs received                     : 0
      DMMs sent                                     : 0
      Valid DMMs received                           : 0
      Invalid DMMs received                         : 0
      DMRs sent                                     : 0
      Valid DMRs received                           : 0
      Invalid DMRs received                         : 0
    Remote MEP count: 1
      Identifier     MAC address        State    Interface
          1      00:21:59:01:e3:3a       ok     ge-1/0/0.1
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@es4> traceroute ethernet maintenance-domain pbbn maintenance-association eline-1
00:21:59:01:e3:3a
Linktrace to 00:21:59:01:e3:3a, Interface : ge-1/0/0.1
      Maintenance Domain: es-domain, Level: 3
      Maintenance Association: eline-1, Local Mep: 2
      Transaction Identifier: 4
```

```
Hop   TTL    Source MAC address        Next-hop MAC address
.
1     62     00:1f:12:b8:3a:95         00:1f:12:b8:3f:b0
2     61     00:22:83:32:df:b0         00:22:83:32:da:95
```

For BEB1:

Use the following operational mode command on BEB1 to verify the MIP status:

```
user@beb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-2/0/0.2          3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-2/0/0.1          3
```

For BEB2:

Use the following operational mode command on BEB2 to verify the MIP status:

```
user@beb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.2          3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.1          3
```

For BEB4:

Use the following operational mode command on BEB4 to verify the MIP status:

```
user@beb4> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-3-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf            : unspecified
```



```
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.2          3

MIP information for instance pbn-3-for-eline eline-svlans-vlan-2100
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.1          3
```

Meaning The command **show oam ethernet connectivity-fault-management interfaces mep-database** displays the CFM connectivity status per service. When used with the maintenance association **eline-1**, it displays the source MAC addresses for the **Remote MEPs** at the bottom of the output. Use the MAC address shown in the **Remote MEPs** section along with the maintenance association to issue the **traceroute ethernet** command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command **show oam ethernet connectivity-fault-management mip** displays all the MIPs created in the system.

Verifying CFM for VLAN 600 in the PBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN 600 using the maintenance domain **es-domain** and the maintenance association **eline-2** at level-3 for OAM monitoring:

- ES1 (Pinot Noir) MEP-1
- ES4 (Reds) MEP-2
- BEB1 (Sangiovese) MIP
- BEB2 (Barbera) MIP
- BEB4 (Cubs) MIP

Action

For ES1:

Use the following operational mode command on ES1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@es1> show oam ethernet connectivity-fault-management mep-database
maintenance-domain es-domain maintenance-association eline-2
Interface name: ge-1/1/0.0, vlan 600, Interface status: Active, Link status: Up
  Maintenance domain name: es-domain, Format: string, Level: 3
    Maintenance association name: eline-2, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 1, Direction: up, MAC address: 00:21:59:01:e3:3a
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                  : no
      Erroneous CCM received                        : no
      Cross-connect CCM received                    : no
      RDI sent by some MEP                          : no
      Some remote MEP's MAC in error state          : no
    Statistics:
      CCMs sent                                     : 29310
      CCMs received out of sequence                 : 0
      LBMs sent                                     : 19
      Valid in-order LBRs received                  : 1
      Valid out-of-order LBRs received              : 0
      LBRs received with corrupted data             : 0
      LBRs sent                                     : 0
      LTMs sent                                     : 2
      LTMs received                                 : 0
      LTRs sent                                     : 0
      LTRs received                                 : 6
      Sequence number of next LTM request           : 2
      1DMs sent                                     : 0
      Valid 1DMs received                           : 0
      Invalid 1DMs received                         : 0
      Out of sync 1DMs received                     : 0
      DMMs sent                                     : 0
      Valid DMMs received                           : 0
      Invalid DMMs received                         : 0
      DMRs sent                                     : 0
      Valid DMRs received                           : 0
      Invalid DMRs received                         : 0
    Remote MEP count: 1
      Identifier    MAC address        State    Interface
          2     00:1f:12:b8:72:98       ok    ge-2/0/0.2
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@es1> traceroute ethernet maintenance-domain pbbn maintenance-association eline-2
mep2
Linktrace to 00:1f:12:b8:72:98, Interface : ge-2/0/0.2
      Maintenance Domain: es-domain, Level: 3
      Maintenance Association: eline-2, Local Mep: 2
      Transaction Identifier: 1
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     60     00:1f:12:b8:72:98         00:00:00:00:00:00
    2     61     00:1f:12:b8:3f:b0         00:1f:12:b8:3a:95
```

```
    3      62      00:21:59:aa:7d:2a         00:21:59:aa:7f:b0
```

For ES4:

Use the following operational mode command on ES4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@es4> show oam ethernet connectivity-fault-management mep-database
maintenance-domain es-domain maintenance-association eline-2
Interface name: ge-1/0/3.6, vlan 600, Interface status: Active, Link status: Up
  Maintenance domain name: es-domain, Format: string, Level: 3
    Maintenance association name: eline-2, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    MEP identifier: 2, Direction: up, MAC address: 00:1f:12:b8:72:98
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                : no
      Erroneous CCM received                      : no
      Cross-connect CCM received                  : no
      RDI sent by some MEP                        : no
      Some remote MEP's MAC in error state        : no
    Statistics:
      CCMs sent                                   : 8135
      CCMs received out of sequence               : 0
      LBMs sent                                   : 0
      Valid in-order LBRs received                : 0
      Valid out-of-order LBRs received            : 0
      LBRs received with corrupted data           : 0
      LBRs sent                                   : 0
      LTMs sent                                   : 1
      LTMs received                               : 0
      LTRs sent                                   : 0
      LTRs received                               : 2
      Sequence number of next LTM request         : 1
      1DMs sent                                   : 0
      Valid 1DMs received                         : 0
      Invalid 1DMs received                       : 0
      Out of sync 1DMs received                   : 0
      DMMs sent                                   : 0
      Valid DMMs received                         : 0
      Invalid DMMs received                       : 0
      DMRs sent                                   : 0
      Valid DMRs received                         : 0
      Invalid DMRs received                       : 0
    Remote MEP count: 1
      Identifier     MAC address        State    Interface
          1      00:21:59:01:e3:3a       ok    ge-1/0/0.2
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@es4> traceroute ethernet maintenance-domain pbbn maintenance-association eline-2
00:21:59:01:e3:3a
Linktrace to 00:21:59:01:e3:3a, Interface : ge-1/0/0.2
      Maintenance Domain: es-domain, Level: 3
      Maintenance Association: eline-2, Local Mep: 2
      Transaction Identifier: 1
```



```
    Hop    TTL    Source MAC address        Next-hop MAC address
    .
    1      62     00:1f:12:b8:3a:95         00:1f:12:b8:3f:b0
    2      61     00:21:59:aa:7f:b0         00:21:59:aa:7d:2a
```

For BEB1:

Use the following operational mode command on BEB1 to verify the MIP status:

```
user@beb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-2/0/0.2          3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-2/0/0.1          3
```

For BEB2:

Use the following operational mode command on BEB2 to verify the MIP status:

```
user@beb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.2          3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.1          3
```

For BEB4:

Use the following operational mode command on BEB4 to verify the MIP status:

```
user@beb4> show oam ethernet connectivity-fault-management mip
```



```
MIP information for instance pbn-3-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.2          3

MIP information for instance pbn-3-for-eline eline-svlans-vlan-2100
  maintenance-domain mhf            : unspecified
  maintenance-association mhf       : unspecified
  default maintenance-domain mhf    : default

  Interface       Level
  pip0.0              3
  ge-1/0/0.1          3
```

Meaning

The command **show oam ethernet connectivity-fault-management interfaces mep-database** displays the CFM connectivity status per service. When used with the maintenance association **eline-2**, it displays the source MAC addresses for the **Remote MEPs** at the bottom of the output. Use the MAC address shown in the **Remote MEPs** section along with the maintenance association to issue the **traceroute ethernet** command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command **show oam ethernet connectivity-fault-management mip** displays all the MIPs created in the system.

Related Documentation

- Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers on page 13
- Understanding Provider Backbone Bridging on MX Series Routers on page 3
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

CHAPTER 5

Provider Backbone Bridging Configuration Statements

This chapter lists the PBB configuration statements:

bridge-domains

Syntax

```
bridge-domains {
  bridge-domain-name {
    bridge-options {
      ...bridge-options-configuration...
    }
    domain-type bridge;
    interface interface-name;
    no-irb-layer-2-copy;
    routing-interface routing-interface-name;
    vlan-id (all | none | number);
    vlan-id-list [ vlan-id-numbers ];
    vlan-tags outer number inner number;
    bridge-options {
      interface interface-name {
        static-mac mac-address;
      }
      interface-mac-limit limit;
      mac-statistics;
      mac-table-size limit;
      no-mac-learning;
    }
  }
}
```

Hierarchy Level
[edit],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name*],
[edit routing-instances *routing-instance-name*]

Release Information
Statement introduced in Junos OS Release 8.4.
Support for logical systems added in Junos OS Release 9.6.
Support for the **no-irb-layer-2-copy** statement added in Junos OS Release 10.2.

Description
(MX Series routers only) Configure a domain that includes a set of logical ports that share the same flooding or broadcast characteristics in order to perform Layer 2 bridging.

Options
bridge-domain-name—Name of the bridge domain.

NOTE: You cannot use the slash (/) character as part of the bridge domain name. If you do, the configuration will not commit.

The remaining statements are explained separately.

Required Privilege Level
routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation
- Configuring a Bridge Domain
- Configuring a Layer 2 Virtual Switch

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

bridge-domain-type

Syntax bridge-domain-type (bvlan | svlan);

Hierarchy Level [edit interfaces *pseudo-logical-interface-name* unit *logical-unit-number* family bridge]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah Provider Backbone Bridge (PBB) configurations, configure the bridge domain type for the routing instance.

Options **bvlan**—The backbone VLAN (B-VLAN) for the provider routing instance configured in the B-component.

svlan —The service VLAN (S-VLAN) for the customer routing instance configured in the I-component.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

default-bvlan

Syntax default-bvlan *vlan-id*;

Hierarchy Level [edit routing-instances *instance-name* pbb-options]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah PBB configuration, specify the default B-VLAN for all unmapped service identifiers (I-SIDs).

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

default-isid

Syntax default-isid *isid-number*;

Hierarchy Level [edit routing-instances *routing-instance-name* service-groups *service-group-name* pbb-service-options]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the default service identifier (I-SID) for all unmapped service VLANs (S-VLANs) for the customer routing instance (I-component) service group.

Options ***default-isid***— Default service identifier. Enter an I-SID in the range from **256** through **16777214**.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

family

Syntax

```
family family {
  accounting {
    destination-class-usage;
    source-class-usage {
      (input | output | input output);
    }
  }
  access-concentrator name;
  address address {
    ... the address subhierarchy appears after the main [edit interfaces interface-name unit
      logical-unit-number family family-name] hierarchy ...
  }
  bridge-domain-type (bvlan | svlan);
  bundle interface-name;
  core-facing;
  demux-destination {
    destination-prefix;
  }
  demux-source {
    source-prefix;
  }
  duplicate-protection;
  dynamic-profile profile-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list [ filter-names ];
    output filter-name;
    output-list [ filter-names ];
  }
  interface-mode (access | trunk);
  ipsec-sa sa-name;
  isid-list all-service-groups;
  keep-address-and-control;
  mac-validate (loose | strict);
  max-sessions number;
  max-sessions-vsa-ignore;
  mtu bytes;
  multicast-only;
  negotiate-address;
  no-redirects:
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;
  protocols [inet iso mpls];
  proxy inet-address address;
  receive-options-packets;
  receive-ttl-exceeded;
  remote (inet-address address | mac-address address);
```

```
rpf-check {
  fail-filter filter-name
  mode loose;
}
sampling {
  input;
  output;
}
service {
  input {
    post-service-filter filter-name;
    service-set service-set-name <service-filter filter-name>;
  }
  output {
    service-set service-set-name <service-filter filter-name>;
  }
}
service-name-table table-name
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
  maximum-seconds>;
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name destination address destination-profile profile-name;
vlan-id number;
vlan-id-list [number number-number];
address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  master-only;
  multipoint-destination address dlci dlci-identifier;
  multipoint-destination address {
    epd-threshold cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate
        sustained rate);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
  preferred;
  primary;
  vrrp-groupgroup-id {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-key key;
    authentication-type authentication;
```



```
            fast-interval milliseconds;
            (preempt | no-preempt) {
              hold-time seconds;
            }
            priority number;
            track {
              interface interface-name {
                bandwidth-threshold bits-per-second priority-cost priority;
                priority-cost priority;
              }
              priority-hold-time seconds;
              route prefix routing-instance instance-name priority-cost priority;
              }
            }
            virtual-address [ addresses ];
            }
          virtual-link-local-addressipv6-address;
        }
      }
```

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Release Information Statement introduced before Junos OS Release 7.4.
Option **max-sessions-vsa-ignore** introduced in Junos OS Release 11.4.

Description Configure protocol family information for the logical interface.

NOTE: Not all subordinate stanzas are available to every protocol family.

Options *family*—Protocol family:

- **any**—Protocol-independent family used for Layer 2 packet filtering

  NOTE: This option is not supported on T4000 Type 5 FPCs.

- **bridge**—(M Series and T Series routers only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation
- **ccc**—Circuit cross-connect protocol suite
- **inet**—Internet Protocol version 4 suite
- **inet6**—Internet Protocol version 6 suite
- **iso**—International Organization for Standardization Open Systems Interconnection (ISO OSI) protocol suite
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16
- **multilink-ppp**—Multilink Point-to-Point Protocol
- **mpls**—Multiprotocol Label Switching (MPLS)
- **pppoe**—Point-to-Point Protocol over Ethernet
- **tcc**—Translational cross-connect protocol suite
- **tnp**—Trivial Network Protocol
- **vpls**—(M Series and T Series routers only) Virtual private LAN service

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Protocol Family
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Junos Services Interfaces Configuration Release 12.3

isid

Syntax isid *isid-number* vlan-id-list [*vlan-ids*];

Hierarchy Level [edit routing-instances *routing-instance-name* service-groups *service-group-name* pbb-service-options]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service identifier (I-SID) for the customer routing instance (I-component) service group.

Options *isid*—Service identifier. Enter an I-SID in the range from **256** through **16777214**.

vlan-id-list [*vlan-ids*]—List of service VLANs (S-VLANs).

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

family

Syntax

```
family family {
  accounting {
    destination-class-usage;
    source-class-usage {
      (input | output | input output);
    }
  }
  access-concentrator name;
  address address {
    ... the address subhierarchy appears after the main [edit interfaces interface-name unit
      logical-unit-number family family-name] hierarchy ...
  }
  bridge-domain-type (bvlan | svlan);
  bundle interface-name;
  core-facing;
  demux-destination {
    destination-prefix;
  }
  demux-source {
    source-prefix;
  }
  duplicate-protection;
  dynamic-profile profile-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list [ filter-names ];
    output filter-name;
    output-list [ filter-names ];
  }
  interface-mode (access | trunk);
  ipsec-sa sa-name;
  isid-list all-service-groups;
  keep-address-and-control;
  mac-validate (loose | strict);
  max-sessions number;
  max-sessions-vsa-ignore;
  mtu bytes;
  multicast-only;
  negotiate-address;
  no-redirects:
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;
  protocols [inet iso mpls];
  proxy inet-address address;
  receive-options-packets;
  receive-ttl-exceeded;
  remote (inet-address address | mac-address address);
```



```
rpf-check {
  fail-filter filter-name
  mode loose;
}
sampling {
  input;
  output;
}
service {
  input {
    post-service-filter filter-name;
    service-set service-set-name <service-filter filter-name>;
  }
  output {
    service-set service-set-name <service-filter filter-name>;
  }
}
service-name-table table-name
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
  maximum-seconds>;
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name destination address destination-profile profile-name;
vlan-id number;
vlan-id-list [number number-number];
address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  master-only;
  multipoint-destination address dlci dlci-identifier;
  multipoint-destination address {
    epd-threshold cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate
        sustained rate);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
  preferred;
  primary;
  vrrp-groupgroup-id {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-key key;
    authentication-type authentication;
```

```
            fast-interval milliseconds;
            (preempt | no-preempt) {
              hold-time seconds;
            }
            priority number;
            track {
              interface interface-name {
                bandwidth-threshold bits-per-second priority-cost priority;
                priority-cost priority;
              }
              priority-hold-time seconds;
              route prefix routing-instance instance-name priority-cost priority;
              }
            }
            virtual-address [ addresses ];
            }
          virtual-link-local-addressipv6-address;
        }
      }
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Release Information

Statement introduced before Junos OS Release 7.4.
Option **max-sessions-vsa-ignore** introduced in Junos OS Release 11.4.

Description

Configure protocol family information for the logical interface.

NOTE: Not all subordinate stanzas are available to every protocol family.

Options *family*—Protocol family:

- **any**—Protocol-independent family used for Layer 2 packet filtering

NOTE: This option is not supported on T4000 Type 5 FPCs.

- **bridge**—(M Series and T Series routers only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation
- **ccc**—Circuit cross-connect protocol suite
- **inet**—Internet Protocol version 4 suite
- **inet6**—Internet Protocol version 6 suite
- **iso**—International Organization for Standardization Open Systems Interconnection (ISO OSI) protocol suite
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16
- **multilink-ppp**—Multilink Point-to-Point Protocol
- **mpls**—Multiprotocol Label Switching (MPLS)
- **pppoe**—Point-to-Point Protocol over Ethernet
- **tcc**—Translational cross-connect protocol suite
- **tnp**—Trivial Network Protocol
- **vpls**—(M Series and T Series routers only) Virtual private LAN service

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Protocol Family
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Junos Services Interfaces Configuration Release 12.3

mac-address

Syntax mac-address *mac-address*;

Hierarchy Level [edit routing-instances (Multiple Routing Entities) *routing-instance-name* service-groups *service-group-name* pbb-service-options]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure a unicast or multicast MAC address for the customer routing instance (I-component) service group.

Options *mac-address*—Specify the MAC address as six hexadecimal bytes in one of the following formats: ***nnnn.nnnn.nnnn*** or ***nn:nn:nn:nn:nn:nn***; for example, **0011.2233.4455** or **00:11:22:33:44:55**.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

pbb-options

Syntax

```
pbb-options {
  default-bvlan vlan-id;
  peer-instance routing-instance-name;
  vlan-id vlan-id isid-list [ isid-numbers ]
}
```

Hierarchy Level [edit routing-instances *routing-instance-name*]

Release Information Statement introduced in JUNOS Release 10.0.

Description Configure provider backbone bridging options for a routing instance.

The remaining statements are explained separately.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

pbb-service-options

Syntax

```
pbb-service-options {
  default-isid isid-number;
  isid isid-number vlan-id-list [ vlan-ids ];
  mac-address mac-address;
}
```

Hierarchy Level [edit routing-instances *routing-instance-name* service-groups *service-group-name*]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure PBB service options for the customer routing instance (I-component) service group.

The remaining statements are explained separately.

Options ***service-group-name***—Name of a service group.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

peer-instance

Syntax peer-instance *routing-instance-name*;

Hierarchy Level [edit routing-instances *instance-name* pbb-options]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the peer PBBN routing instance in the I-component routing instance.

Options ***pbbn-instance-name***—Name of the PBBN routing instance.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

routing-instances (Multiple Routing Entities)

Syntax routing-instances *routing-instance-name* { ... }

Hierarchy Level [edit],
[edit logical-systems *logical-system-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure an additional routing entity for a router. You can create multiple instances of BGP, IS-IS, OSPF, OSPFv3, and RIP for a router. You can also create multiple routing instances for separating routing tables, routing policies, and interfaces for individual wholesale subscribers (retailers) in a Layer 3 wholesale network.

Each routing instance consist of the following:

- A set of routing tables
- A set of interfaces that belong to these routing tables
- A set of routing option configurations

Each routing instance has a unique name and a corresponding IP unicast table. For example, if you configure a routing instance with the name **my-instance**, its corresponding IP unicast table is my-instance.inet.0. All routes for **my-instance** are installed into my-instance.inet.0.

Routes are installed into the default routing instance inet.0 by default, unless a routing instance is specified.

In Junos OS Release 9.0 and later, you can no longer specify a routing-instance name of *master*, *default*, or *bgp* or include special characters within the name of a routing instance.

In Junos OS Release 9.6 and later, you can include a slash (/) in a routing-instance name only if a logical system is not configured. That is, you cannot include the slash character in a routing-instance name if a logical system other than the default is explicitly configured. Routing-instance names, further, are restricted from having the form **__.*__** (beginning and ending with underscores). The colon **:** character cannot be used when multitopology routing (MTR) is enabled.

Default Routing instances are disabled for the router.

Options *routing-instance-name*—Name of the routing instance. This must be a non-reserved string of not more than 128 characters.

The remaining statements are explained separately.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Interprovider Layer 3 VPN Option A
- Example: Configuring Interprovider Layer 3 VPN Option B
- Example: Configuring Interprovider Layer 3 VPN Option C
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

service-groups

Syntax

```
service-groups {
  service-group-name {
    pbb-service-options {
      default-isid isid-number;
      isid isid-number vlan-id-list [ vlan-ids ];
      mac-address mac-address;
    }
    service-type (elan | eline);
  }
}
```

Hierarchy Level [edit routing-instances (Multiple Routing Entities) *routing-instance-name*]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service groups to be supported in the customer routing instance (I-component).

The remaining statements are explained separately.

Options *service-group-name*—Name of a service group.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

service-type

Syntax service-type (elan | eline);

Hierarchy Level [edit routing-instances (Multiple Routing Entities) *routing-instance-name* service-groups]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service type for the service group in the customer routing instance (I-component).

Options **elan**—Connects a set of customer endpoints (like a bridged Ethernet network). E-LAN service is also known as point-to-multipoint service.

eline—Connects two customer Ethernet ports over a WAN. E-LINE service is also known as point-to-point service.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Understanding Provider Backbone Bridging on MX Series Routers on page 3

unit

Syntax

```
unit logical-unit-number {
  accept-source-mac {
    mac-address mac-address {
      policer {
        input cos-policer-name;
        output cos-policer-name;
      }
    }
  }
  accounting-profile name;
  advisory-options {
    downstream-rate rate;
    upstream-rate rate;
  }
  allow-any-vci;
  atm-scheduler-map (map-name | default);
  backup-options {
    interface interface-name;
  }
  bandwidth rate;
  cell-bundle-size cells;
  clear-dont-fragment-bit;
  compression {
    rtp {
      maximum-contexts number <force>;
      f-max-period number;
      queues [ queue-numbers ];
      port {
        minimum port-number;
        maximum port-number;
      }
    }
  }
  compression-device interface-name;
  copy-tos-to-outer-ip-header;
  demux-destination family;
  demux-source family;
  demux-options {
    underlying-interface interface-name;
  }
  description text;
  interface {
    l2tp-interface-id name;
    (dedicated | shared);
  }
  dialer-options {
    activation-delay seconds;
    callback;
    callback-wait-period time;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
```

```
    incoming-map {
        caller caller-id) | accept-all;
        initial-route-check seconds;
        load-interval seconds;
        load-threshold percent;
        pool pool-name;
        redial-delay time;
        watch-list {
            [ routes ];
        }
    }
}
disable;
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
family family-name {
    ... the family subhierarchy appears after the main [edit interfaces interface-name unit
        logical-unit-number] hierarchy ...
}
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap |
    swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (disable | seconds);
```



```
output-vlan-map {
   (pop | pop-pop | pop-swap | push | push-push | swap |
   swap-push | swap-swap);
   inner-tag-protocol-id tpid;
   inner-vlan-id number;
   tag-protocol-id tpid;
   vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
   chap {
      access-profile name;
      default-chap-secret name;
      local-name name;
      passive;
   }
   compression {
      acfc;
      pfc;
   }
   dynamic-profile profile-name;
   lcp-restart-timer milliseconds;
   loopback-clear-timer seconds;
   ncp-restart-timer milliseconds;
   pap {
      access-profile name;
      default-pap-password password;
      local-name name;
      local-password password;
      passive;
   }
}
pppoe-options {
   access-concentrator name;
   auto-reconnect seconds;
   (client | server);
   service-name name;
   underlying-interface interface-name;
}
pppoe-underlying-options {
   access-concentrator name;
   dynamic-profile profile-name;
   max-sessions number;
}
proxy-arp;
service-domain (inside | outside);
shaping {
   (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst
      length);
   queue-length number;
}
short-sequence;
targeted-distribution;
```

```
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
  backup-destination address;
  destination address;
  key number;
  routing-instance {
    destination routing-instance-name;
  }
  source source-address;
  ttl number;
}
vci vpi-identifier.vci-identifier;
vci-range start start-vci end end-vci;
vpi vpi-identifier;
vlan-id number;
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
family family {
  accounting {
    destination-class-usage;
    source-class-usage {
      (input | output | input output);
    }
  }
  access-concentrator name;
  address address {
    ... the address subhierarchy appears after the main [edit interfaces interface-name unit
      logical-unit-number family family-name] hierarchy ...
  }
  bridge-domain-type (bvlan | svlan);
  bundle interface-name;
  core-facing;
  demux-destination {
    destination-prefix;
  }
  demux-source {
    source-prefix;
  }
  duplicate-protection;
  dynamic-profile profile-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list [ filter-names ];
    output filter-name;
    output-list [ filter-names ];
  }
  interface-mode (access | trunk);
  ipsec-sa sa-name;
  isid-list all-service-groups;
  keep-address-and-control;
  mac-validate (loose | strict);
  max-sessions number;
```



```
mtu bytes;
multicast-only;
no-redirects;
policer {
   arp policer-template-name;
   input policer-template-name;
   output policer-template-name;
}
primary;
protocols [inet iso mpls];
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check {
   fail-filter filter-name
   mode loose;
}
sampling {
   input;
   output;
}
service {
   input {
      post-service-filter filter-name;
      service-set service-set-name <service-filter filter-name>;
   }
   output {
      service-set service-set-name <service-filter filter-name>;
   }
}
service-name-table table-name
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name destination address destination-profile profile-name;
vlan-id number;
vlan-id-list [number number-number];
address address {
   arp ip-address (mac | multicast-mac) mac-address <publish>;
   broadcast address;
   destination address;
   destination-profile name;
   eui-64;
   master-only;
   multipoint-destination address {
      dlci dlci-identifier;
      epd-threshold cells <plp1 cells>;
      inverse-arp;
      oam-liveness {
         up-count cells;
         down-count cells;
      }
      oam-period (disable | seconds);
      shaping {
```

```
                (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate
                  sustained rate);
                queue-length number;
              }
              vci vpi-identifier.vci-identifier;
            }
            preferred;
            primary;
            (vrrp-group | vrrp-inet6-group) group-number {
              (accept-data | no-accept-data);
              advertise–interval seconds;
              authentication-type authentication;
              authentication-key key;
              fast-interval milliseconds;
              (preempt | no-preempt) {
                hold-time seconds;
              }
              priority number;
              track {
                interface interface-name {
                  bandwidth-threshold bits-per-second priority-cost number;
                }
                priority-hold-time seconds;
                route ip-address/prefix-length routing-instance instance-name priority-cost cost;
              }
              virtual-address [ addresses ];
              virtual-link-local-address ipv6–address;
              vrrp-inherit-from {
                active-interface interface-name;
                active-group group-number;
              }
            }
          }
        }
      }
```

Hierarchy Level [edit interfaces *interface-name*],
[edit logical-systems *logical-system-name* interfaces *interface-name*],
[edit interfaces interface-set *interface-set-name* interface *interface-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.

Options ***logical-unit-number***—Number of the logical unit.

Range: 0 through 1,073,741,823 for demux and PPPoE static interfaces only. 0 through 16,385 for all other static interface types.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Logical Interface Properties
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Junos Services Interfaces Configuration Release 12.3

vlan-id (Provider Backbone Bridge)

Syntax vlan-id *vlan-id* isid-list [*isid-numbers*];

Hierarchy Level [edit routing-instances *instance-name* pbb-options]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the mapping for the service identifier (I-SID) between the service VLAN (S-VLAN) and the backbone VLANs (B-VLANs).

Options ***vlan-id***—Configure the B-VLAN in the range from **0** through **4094**.

isid-list [*isid-numbers*]—I-SIDs for the B-VLAN routing instance. Specify one or more values in the range from **256** through **16777214**.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

vlan-id (Bridge Domain)

Syntax vlan-id (all | none | *number*);

Hierarchy Level [edit bridge-domains *bridge-domain-name*],
[edit logical-systems *logical-system-name* bridge-domains*bridge-domain-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* bridge-domains*bridge-domain-name*],
[edit routing-instances *routing-instance-name*bridge-domains *bridge-domain-name*]

Release Information Statement introduced in Junos OS Release 8.4.
Support for Layer 2 trunk ports added in Junos OS Release 9.2.
Support for SRX 3400, SRX 3600, SRX 5600, and SRX 5800 devices added in Junos OS Release 9.6.
Support for logical systems added in Junos OS Release 9.6.

Description Specify a VLAN identifier (VID) to include in the packets sent to and from the bridge domain or a VPLS routing instance.

NOTE: **When configuring a VLAN identifier for provider backbone bridge (PBB) routing instances, dual-tagged VIDs and the none option are not permitted.**

Options *number*—A valid VLAN identifier. If you configure multiple bridge domains with a valid VLAN identifier, you must specify a unique VLAN identifier for each domain. However, you can use the same VLAN identifier for bridge domains that belong to different virtual switches. Use this option to send singly tagged frames with the specified VLAN identifier over VPLS VT interfaces.

NOTE: **If you specify a VLAN identifier, you cannot also use the all option. They are mutually exclusive.**

all—Specify that the bridge domain spans all the VLAN identifiers configured on the member logical interfaces.

NOTE: **You cannot specify the all option if you include a routing interface in the bridge domain.**

none—Specify to enable shared VLAN learning or to send untagged frames over VPLS VT interfaces.

NOTE: Multichassis link aggregation (MC-LAG) does not support the **none** option with the **vlan-id** statement with bridge domains.

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring a Bridge Domain
- Configuring VLAN Identifiers for Bridge Domains and VPLS Routing Instances
- Configuring Bridge Domains as Switches for Layer 2 Trunk Ports
- Configuring a Layer 2 Virtual Switch
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Example: Configuring Interfaces and Routing Instances for a User Logical System
- bridge-domains on page 148

CHAPTER 6

Connectivity Fault Management Configuration Statements

This chapter lists the Connectivity Fault Management configuration statements:

- [edit protocols oam] Hierarchy Level on page 175

[edit protocols oam] Hierarchy Level

The following statement hierarchy can also be included at the **[edit logical-systems *logical-system-name*]** hierarchy level.

```
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
      ... the connectivity-fault-management subhierarchy appears after the main [edit
        protocols oam ethernet] hierarchy ...
      evcs evc-id {
        evc-protocol (cfm maintenance-association association-name
          maintenance-domain domain-name) | (vpls routing-instance instance-name);
        multipoint-to-multipoint;
        remote-uni-count count;
      }
      link-fault-management {
      ... the link-fault-management subhierarchy appears after the main [edit protocols
        oam ethernet] hierarchy ...
      lmi {
        interface interface-name {
          evc evc-name {
            default-evc;
            vlan-list [ vlan-ids ];
          }
          evc-map-type (all-to-one-bundling | bundling | service-multiplexing);
          polling-verification-timer seconds;
          status-counter number;
          uni-id uni-id;
        }
        polling-verification-timer value;
        status-counter count;
        traceoptions {
```

```
            file <filename> <files number> <match regular-expression>
                <size maximum-file-size> <world-readable | no-world-readable>;
            flag flag;
            no-remote-trace;
        }
    }
}

ethernet {
    connectivity-fault-management {
        action-profile profile-name {
            default-actions {
                interface-down;
            }
            event {
                adjacency-loss;
                connection-protection-tlv (using-protection-path | using-working-path);
                interface-status-tlv (down | lower-layer-down);
                port-status-tlv blocked;
                rdi;
            }
        }
        connection-protection {
            mark-connection-protection-tlv;
        }
        linktrace {
            age (10s | 30s | 1m | 10m | 30m);
            path-database-size number;
        }
        maintenance-domain domain-name {
        ... the maintenance-domain subhierarchy appears after the main [edit protocols
            oam ethernet connectivity-fault-management] hierarchy ...
        performance-monitoring {
            delegate-server-processing;
            hardware-assisted-timestamping;
            sla-iterator-profiles {
                profile-name {
                    disable;
                    calculation-weight {
                        delay delay-weight;
                        delay-variation delay-variation-weight;
                    }
                    cycle-time milliseconds;
                    iteration-period connections;
                    measurement-type (loss | two-way-delay);
                }
            }
        }
        policer {
            all policer-name;
            continuity-check policer-name;
            other policer-name;
        }
        traceoptions {
            file <filename> <files number> <match regular-expression>
                <size maximum-file-size> <world-readable | no-world-readable>;
```



```
      flag flag;
      no-remote-trace;
    }
  }

connectivity-fault-management {
  maintenance-domain domain-name {
    bridge-domain domain-name <vlan-id [ vlan-ids ]>;
    instance routing-instance-name;
    interface interface-name;
    level number;
    maintenance-association association-name {
    ... the maintenance-association subhierarchy appears after the main [edit protocols
      oam ethernet connectivity-fault-management maintenance-domain] hierarchy
      ...
    mip-half-function (default | explicit | none);
    name-format (character-string | dns | mac+2oct | none);
    virtual-switch routing-instance-name {
      bridge-domain domain-name <vlan-id [ vlan-ids ]>;
    }
  }

  maintenance-domain domain-name {
    maintenance-association association-name {
      continuity-check {
        connection-protection-tlv;
        convey-loss-threshold;
        hold-interval minutes;
        interface-status-tlv;
        interval (100ms | 1s | 10s | 1m | 10m);
        measurement-type number;
        port-status-tlv;
      }
      mep mep-id {
        auto-discovery;
        direction (down | up);
        interface interface-name (protect | working);
        lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
          rem-err-xcon | xcon);
        priority number;
        remote-mep mep-id {
          action-profile profile-name;
          sla-iterator-profile profile-name {
            data-tlv-size bytes;
            iteration-count frames;
            priority priority-value;
          }
        }
      }
      mip-half-function (default | defer | explicit | none);
      policer {
        all policer-name;
        continuity-check policer-name;
        other policer-name;
      }
      short-name-format (2octet | character-string | icc | rfc-2685-vpn-id | vlan);
```

```
                }
            }
        }
    }

    ethernet {
        link-fault-management {
            action-profile profile-name {
                action {
                    link-down;
                    send-critical-event;
                    syslog;
                }
                event {
                    link-adjacency-loss;
                    link-event-rate {
                        frame-error count;
                        frame-period count;
                        frame-period-summary count;
                        symbol-period count;
                    }
                    protocol-down;
                }
            }
            interface interface-name {
                apply-action-profile profile-name;
                event-thresholds {
                    frame-error count;
                    frame-period count;
                    frame-period-summary count;
                    symbol-period count;
                }
                link-discovery (active | passive);
                negotiation-options {
                    allow-remote-loopback;
                    no-allow-link-events;
                }
                pdu-interval interval;
                pdu-threshold threshold-value;
                remote-loopback;
            }
            traceoptions {
                file <filename> <files number> <match regular-expression>
                    <size maximum-file-size> <world-readable | no-world-readable>;
                flag flag;
                no-remote-trace;
            }
        }
    }
}
}
```

Related Documentation

- Notational Conventions Used in Junos OS Configuration Hierarchies
- [edit protocols] Hierarchy Level

auto-discovery

Syntax auto-discovery;

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]

Release Information Statement introduced in Junos OS Release 8.4.

Description Enable the MEP to accept continuity check messages from all remote MEPs.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

bridge-domain

Syntax

```
bridge-domain name;
  vlan-id [ vlan-identifiers ];
}
```

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *maintenance-domain-name*],
[edit protocols oam ethernet connectivity-fault-management maintenance-domain *maintenance-domain-name* virtual-switch *virtual-switch-name*]

Release Information Statement introduced in Junos OS Release 9.4.

Description (MX Series routers only) Specify the OAM Ethernet CFM maintenance domain bridge domain.

Options *name*—Specify the name of the bridge domain.

vlan-identifiers—Specify one or more VLAN identifiers.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Maintenance Intermediate Points
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- maintenance-domain on page 191

connectivity-fault-management

Syntax

```
connectivity-fault-management {
  action-profile profile-name {
    default-actions {
      interface-down;
    }
    event {
      adjacency-loss;
      interface-status-tlv (down | lower-layer-down);
      port-status-tlv blocked;
      rdi;
    }
  }
  performance-monitoring {
    delegate-server-processing;
    hardware-assisted-timestamping;
    sla-iterator-profiles {
      profile-name {
        disable;
        calculation-weight {
          delay delay-weight;
          delay-variation delay-variation-weight;
        }
        cycle-time milliseconds;
        iteration-period connections;
        measurement-type (loss | statistical-frame-loss | two-way-delay);
      }
    }
  }
  linktrace {
    age (30m | 10m | 1m | 30s | 10s);
    path-database-size path-database-size;
  }
  maintenance-domain domain-name {
    bridge-domain <vlan-id [ vlan-ids ]>;
    instance routing-instance-name;
    interface interface-name;
    level number;
    name-format (character-string | none | dns | mac+2oct);
    maintenance-association ma-name {
      protect-maintenance-association protect-ma-name;
      remote-maintenance-association remote-ma-name;
      short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
      continuity-check {
        convey-loss-threshold;
        hold-interval minutes;
        interface-status-tlv;
        interval (10m | 10s | 1m | 1s| 100ms);
        measurement-type number;
        port-status-tlv;
      }
      mep mep-id {
        auto-discovery;
```

```
            direction (up | down);
            interface interface-name (protect | working);
            lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
              rem-err-xcon | xcon );
            priority number;
            remote-mep mep-id {
              action-profile profile-name;
              sla-iterator-profile profile-name {
                data-tlv-size size;
                iteration-count count-value;
                priority priority-value;
              }
            }
          }
        }
        virtual-switch routing-instance-name {
          bridge-domain name <vlan-ids [ vlan-ids ]>;
        }
      }
    }
```

Hierarchy Level [edit protocols oam ethernet]

Release Information Statement introduced in Junos OS Release 8.4.

Description For Ethernet interfaces on M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M120, M320, MX Series, and T Series routers, specify connectivity fault management for IEEE 802.1ag Operation, Administration, and Management (OAM) support.
In Junos OS Release 9.3 and later, this statement is also supported on aggregated Ethernet interfaces.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- IEEE 802.1ag OAM Connectivity Fault Management Overview
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

continuity-check

Syntax

```
continuity-check {
  convey-loss-threshold;
  hold-interval minutes;
  interface-status-tlv;
  interval (10m | 10s | 1m | 1s| 100ms | 10ms);
  measurement-type number;
  port-status-tlv;
}
```

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name*]

Release Information Statement introduced in Junos OS Release 8.4.

Description Specify continuity check protocol options.

Options

convey-loss-threshold—Enable loss-threshold-tlv transmission.

hold-interval ***minutes***—Specify the continuity check hold-interval, in minutes.

interface-status-tlv—Enable interface-status-tlv transmission.

interval ***(10m | 10s | 1m | 1s| 100ms | 10ms)***—Specify the continuity check interval.

loss-threshold ***minutes***—Specify the loss-threshold, in minutes.

port-status-tlv—Enable port-status-tlv transmission.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Continuity Check Protocol
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

direction

Syntax direction (up | down);

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]

Release Information Statement introduced in Junos OS Release 8.4.

Description Configure the direction of the MEP.

Options **up**—An UP MEP CCM is transmitted out of every logical interface which is part of the same bridging or vpls instance except for the interface configured on this MEP.

NOTE: The up direction for MEP is not supported on T Series routers.

down—Down MEP CCMs are transmitted only out the interface configured on this MEP.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- IEEE 802.1ag OAM Connectivity Fault Management Overview

ethernet (Protocols OAM)

Syntax

```
ethernet {
  connectivity-fault-management {
    action-profile profile-name {
      default-actions {
        interface-down;
      }
    }
    performance-monitoring {
      delegate-server-processing;
      hardware-assisted-timestamping;
      sla-iterator-profiles {
        profile-name {
          disable;
          calculation-weight {
            delay delay-weight;
            delay-variation delay-variation-weight;
          }
          cycle-time milliseconds;
          iteration-period connections;
          measurement-type (loss | statistical-frame-loss | two-way-delay);
        }
      }
    }
    linktrace {
      age (30m | 10m | 1m | 30s | 10s);
      path-database-size path-database-size;
    }
    maintenance-domain domain-name {
      level number;
      name-format (character-string | none | dns | mac+2octet);
      maintenance-association ma-name {
        short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
        protect-maintenance-association protect-ma-name;
        remote-maintenance-association remote-ma-name;
        continuity-check {
          convey-loss-threshold;
          hold-interval minutes;
          interface-status-tlv;
          interval (10m | 10s | 1m | 1s| 100ms);
          measurement-type number;
          port-status-tlv;
        }
        mep mep-id {
          auto-discovery;
          direction (up | down);
          interface interface-name (protect | working);
          lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
            rem-err-xcon | xcon );
          priority number;
          remote-mep mep-id {
            action-profile profile-name;
            sla-iterator-profile profile-name {
```

```
                data-tlv-size size;
                iteration-count count-value;
                priority priority-value;
              }
            }
          }
        }
      }
    }
    evcs evc-id {
      evc-protocol cfm management-domain domain-id (management-association
        association-id | vpls (routing-instance instance-id);
      remote-uni-count count;
      multipoint-to-multipoint;
    }
    link-fault-management {
      action-profile profile-name {
        action {
          link-down;
          send-critical-event;
          syslog;
        }
        event {
          link-adjacency-loss;
          link-event-rate {
            frame-error count;
            frame-period count;
            frame-period-summary count;
            symbol-period count;
          }
          protocol-down;
        }
      }
      interface interface-name {
        apply-action-profile;
        link-discovery (active | passive);
        pdu-interval interval;
        pdu-threshold threshold-value;
        remote-loopback;
        event-thresholds {
          frame-error count;
          frame-period count;
          frame-period-summary count;
          symbol-period count;
        }
        negotiation-options {
          allow-remote-loopback;
          no-allow-link-events;
        }
      }
    }
    lmi {
      status-counter count;
      polling-verification-timer value;
      interface name {
        uni-id uni-name;
```

```
      status-counter number;
      polling-verification-timer value;
      evc-map-type (all-to-one-bundling | bundling | service-multiplexing);
      evc evc-name {
        default-evc;
        vlan-list vlan-id-list;
      }
    }
  }
}
```

Hierarchy Level [edit protocols oam]

Release Information Statement introduced in Junos OS Release 8.2.

Description For Ethernet interfaces on M320, MX Series, and T Series routers, provide fault signaling and detection for 802.3ah Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Enabling IEEE 802.3ah OAM Support
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

interface (IEEE 802.1ag OAM Connectivity-Fault Management)

Syntax interface (*interface-name* | ((ge- | xe-) (*fpc/pic/port* | *fpc/pic/port.unit-number* | *fpc/pic/port.unit-number* vlan *vlan-id*)));

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]

Release Information Statement introduced in Junos OS Release 8.4.

Description For Ethernet interfaces on M320, MX Series, and T Series routers, configure IEEE 802.1ag Operation, Administration, and Management (OAM) support.

For Gigabit Ethernet interfaces and 10-Gigabit Ethernet interfaces on MX Series routers, configure IEEE 802.1ag Connectivity Fault Management (CFM) support on trunk interface ports.

Options **interface-name**—Interface to which the MEP is attached. It could be a physical Ethernet interface, logical Ethernet interface, or on a specific VLAN of a trunk port interface (MX Series only).

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

interval

Syntax interval (10m | 10s | 1m | 1s | 100ms | 10ms);

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* continuity-check]

Release Information Statement introduced in Junos OS Release 8.4.
Ten milliseconds option introduced in Junos OS Release 9.1.

Description The time between continuity check messages.

Options **10m**—10 minutes.

10s—10 seconds.

1m—1 minute.

1s—1 second.

100ms—100 milliseconds.

10ms—10 milliseconds.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Continuity Check Protocol
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

level

Syntax level *number*;

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name*]

Release Information Statement introduced in Junos OS Release 8.4.
Statement introduced in junos os release 12.1X48 for PTX Series Packet Transport Switches.

Description A number used in CFM messages to identify the maintenance association.

Options *number*—A number used to identify the maintenance domain to which the CFM message belongs.

Range: 0 through 7

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Maintenance Domain Level
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

maintenance-association

Syntax

```
maintenance-association ma-name {
  short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
  protect-maintenance-association protect-ma-name;
  remote-maintenance-association remote-ma-name;
  continuity-check {
    hold-interval minutes;
    interval (10m | 10s | 1m | 1s| 100ms);
    measurement-type number;
  }
  mep mep-id {
    auto-discovery;
    direction (up | down);
    interface interface-name (protect | working);
    lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
      rem-err-xcon | xcon );
    priority number;
    remote-mep mep-id {
      action-profile profile-name;
      sla-iterator-profile profile-name {
        data-tlv-size size;
        iteration-count count-value;
        priority priority-value;
      }
    }
  }
}
```

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name*]

Release Information Statement introduced in Junos OS Release 8.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.

Description Configure the name of the maintenance association in IEEE-compliant format.

Options **ma-name**—The name of the maintenance association within the maintenance domain.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Creating a Maintenance Association
- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

maintenance-domain

Syntax

```
maintenance-domain domain-name {
  bridge-domain name <vlan-id [ vlan-ids ]>;
  instance vpls-instance-name;
  level number;
  maintenance-association ma-name {
    protect-maintenance-association protect-ma-name;
    remote-maintenance-association remote-ma-name;
    short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
    continuity-check {
      hold-interval minutes;
      interval (10m | 10s | 1m | 1s| 100ms);
      measurement-type number
    }
    mep mep-id {
      auto-discovery;
      direction (up | down);
      interface interface-name (protect | working);
      lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
        rem-err-xcon | xcon );
      priority number;
      remote-mep mep-id {
        action-profile profile-name;
        sla-iterator-profile profile-name {
          data-tlv-size size;
          iteration-count count-value;
          priority priority-value;
        }
      }
    }
    mip-half-function(none | default | explicit);
    name-format (character-string | none | dns | mac+2oct);
  }
  virtual-switch name {
    bridge-domain name <vlan-id [ vlan-ids ]>;
  }
}
```

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management]

Release Information Statement introduced in Junos OS Release 8.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.

Description Configure the name of the maintenance domain in IEEE-compliant format.

Options *domain-name*—Name of the maintenance domain.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Creating the Maintenance Domain
- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

mep

Syntax

```
mep mep-id {
  auto-discovery;
  direction (up | down);
  interface interface-name (protect | working);
  priority number;
  remote-mep mep-id {
    action-profile profile-name;
    sla-iterator-profile profile-name {
      data-tlv-size size;
      iteration-count count-value;
      priority priority-value;
    }
  }
}
```

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name*]

Release Information Statement introduced in Junos OS Release 8.4.

Description The numeric identifier of the maintenance association end point (MEP) within the maintenance association.

Options **mep-id**—Specify the numeric identifier of the MEP.

Range: 1 through 8191

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

mip-half-function

Syntax mip-half-function (none | default | explicit);

Hierarchy Level [edit protocols oam ethernet connectivity-fault-managementmaintenance-domain *md-name*],
[edit protocols oam ethernet connectivity-fault-managementmaintenance-association *ma-name*]

Release Information Statement introduced in Junos OS Release 9.6.

Description Specify the OAM Ethernet CFM maintenance domain MIP half functions.

NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains or maintenance associations, it is essential that the **mip-half-function** value for all maintenance domains and maintenance associations are the same.

Options **none**—Specify to not use the mip-half-function.

default—Specify to use the default mip-half-function.

explicit—Specify an explicit mip-half-function.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Creating the Maintenance Domain
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105
- maintenance-domain on page 191

virtual-switch

Syntax virtual-switch *name* bridge-domain *name* vlan-id [*vlan-ids*];

Hierarchy Level [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* default-*x*]

Release Information Statement introduced in Junos OS Release 9.6.

Description Specify the routing-instance type as a virtual switch, under which bridge-domain MIPs must be enabled.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring MIP for Bridge Domains of a Virtual Switch
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 105

CHAPTER 7

CoS Configuration Statements

This chapter lists the CoS configuration statements:

buffer-size (Schedulers)

Syntax buffer-size (percent *percentage* | remainder | temporal *microseconds*);

Hierarchy Level [edit class-of-service schedulers *scheduler-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.
Statement introduced in Junos OS Release 12.2 for ACX Series Routers.

Description Specify buffer size.

NOTE: **On PTX Series Packet Transport Switches, buffer-size cannot be configured on rate-limited queues.**

Default If you do not include this statement, the default scheduler transmission rate and buffer size percentages for queues 0 through 7 are 95, 0, 0, 5, 0, 0, 0, and 0 percent, respectively.

Options **percent *percentage***—Buffer size as a percentage of the total buffer.

Range: 0 through 100

remainder—Remaining buffer available.

temporal *microseconds*—Buffer size as a temporal value. The queuing algorithm starts dropping packets when it queues more than a computed number of bytes. This maximum is computed by multiplying the logical interface speed by the configured temporal value.

Range: The ranges vary by platform. See Buffer Size Temporal Value Ranges by Router Type.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Scheduler Buffer Size
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

classifiers (Definition)

Syntax

```
classifiers {
  type classifier-name {
    import (classifier-name | default);
    forwarding-class class-name {
      loss-priority level code-points [ aliases ] [ bit-patterns ];
    }
  }
}
```

Hierarchy Level

[edit class-of-service],
[edit class-of-service routing-instances *routing-instance-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
ieee-802.1ad option introduced in Junos OS Release 9.2.

Description

Define a CoS behavior aggregate (BA) classifier for classifying packets. You can associate the classifier with a forwarding class or code-point mapping, and import a default classifier or one that is previously defined.

NOTE: The **[edit class-of-service routing-instances *routing-instance-name*]** hierarchy level and the **dscp-ipv6** and **ieee-802.1ad** classifier types are not supported on ACX Series routers.

Options

classifier-name—Name of the aggregate behavior classifier.

type—Traffic type: **dscp**, **dscp-ipv6**, **exp**, **ieee-802.1**, **ieee-802.1ad**, **inet-precedence**.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Overview of BA Classifier Types
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Configuring CoS on ACX Series Universal Access Routers

code-point

Syntax code-point [*aliases*] [*bit-patterns*];

Hierarchy Level [edit class-of-service rewrite-rules *type rewrite-name* forwarding-class *class-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Specify one or more code-point aliases or bit sets for association with a forwarding class.

Options ***aliases***—Name of each alias.

bit-patterns—Value of the code-point bits, in decimal form.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Rewrite Rules

code-points

Syntax code-points ([*aliases*] | [*bit-patterns*]);

Hierarchy Level [edit class-of-service classifiers *type classifier-name* forwarding-class *class-name* loss-priority *level*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 8.5 for J Series devices.
Statement introduced in Junos OS Release 9.2 for SRX Series devices.

Description Specify one or more DSCP code-point aliases or bit sets for association with a forwarding class.

Options ***aliases***—Name of the DSCP alias.

bit-patterns—Value of the code-point bits, in six-bit binary form.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Overview of BA Classifier Types
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Example: Configuring Behavior Aggregate Classifiers
- Example: Configuring Forwarding Classes

family (Firewall)

Syntax

```
family family-name {
  filter filter-name {
    accounting-profile name;
    enhanced-mode;
    interface-specific;
    physical-interface-filter;
  }
  prefix-action name {
    count;
    destination-prefix-length prefix-length;
    policer policer-name;
    source-prefix-length prefix-length;
    subnet-prefix-length prefix-length;
  }
  simple-filter filter-name {
    term term-name {
      from {
        match-conditions;
      }
      then {
        action;
        action-modifiers;
      }
    }
  }
}
```

Hierarchy Level

[edit firewall],
[edit logical-systems *logical-system-name* firewall]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
simple-filter statement introduced in Junos OS Release 7.6.
any family type introduced in Junos OS Release 8.0 (not supported on PTX Series Packet Transport Switches).
bridge family type introduced in Junos OS Release 8.4 (MX Series routers only).

Description

Configure a firewall filter for IP version 4 (IPv4) or IP version 6 (IPv6) traffic. On the MX Series routers only, configure a firewall filter for Layer 2 traffic in a bridging environment.

Options

family-name—Version or type of addressing protocol:

- **any**—Protocol-independent match conditions.
- **bridge**—(MX Series routers only) Layer 2 packets that are part of bridging domain.
- **ccc**—Layer 2 switching cross-connects.
- **inet**—IPv4 addressing protocol.
- **inet6**—IPv6 addressing protocol.

- **mpls**—MPLS.
- **vpls**—Virtual private LAN service (VPLS).

The remaining statements are explained separately.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Guidelines for Configuring Standard Firewall Filters
- Guidelines for Configuring Service Filters
- Guidelines for Configuring Simple Filters

filter (Configuring)

Syntax

```
filter filter-name {
  accounting-profile name;
  enhanced-mode;
  interface-shared;
  interface-specific;
  physical-interface-filter;
  term term-name {
    filter filter-name;
    from {
      match-conditions;
    }
    then {
      actions;
    }
  }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall family *family-name*],
[edit firewall family *family-name*],
[edit logical-systems *logical-system-name* firewall family *family-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
physical-interface-filter statement introduced in Junos OS Release 9.6.
Support at the **[edit dynamic-profiles ... family family-name]** hierarchy level introduced in Junos OS Release 11.4.
Support for the **interface-shared**> statement introduced in Junos OS Release 12.2.

Description

Configure firewall filters.

Options

filter-name—Name that identifies the filter. This must be a non-reserved string of not more than 64 characters. To include spaces in the name, enclose it in quotation marks (“ ”). In Junos OS Release 9.0 and later, you can no longer use special characters within the name of a firewall filter. Firewall filter names are restricted from having the form **__.*__** (beginning and ending with underscores) or **__.*** (beginning with an underscore.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Guidelines for Configuring Standard Firewall Filters
- Guidelines for Applying Standard Firewall Filters
- Configuring Multifield Classifiers
- Using Multifield Classifiers to Set PLP
- simple-filter

firewall

Syntax firewall { ... }

Hierarchy Level [edit],
[edit logical-systems *logical-system-name*]
[edit dynamic-profiles *profile-name*],

Release Information Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.

Description Configure firewall filters.

The statements are explained separately.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Guidelines for Configuring Standard Firewall Filters
- Guidelines for Configuring Service Filters
- Guidelines for Configuring Simple Filters
- Configuring Multifield Classifiers
- Using Multifield Classifiers to Set PLP

forwarding-classes (Class-of-Service)

Syntax

```
forwarding-classes {
  class queue-num queue-number priority (high | low);
  queue queue-number class-name priority (high | low) [ policing-priority (premium | normal) ];
}
```

Hierarchy Level

[edit class-of-service]

Release Information

Statement introduced before Junos OS Release 7.4.
policing-priority option introduced in Junos OS Release 9.5.
Statement introduced on PTX Series Packet Transport Switches in Junos OS Release 12.1.

Description

Associate the forwarding class with a queue name and number. For M320, MX Series, and T Series routers only, you can configure fabric priority queuing by including the **priority** statement. For Enhanced IQ PICs, you can include the **policing-priority** option.

NOTE: **The priority add policing-priority options are not supported on PTX Series Packet Transport Switches.**

The statements are explained separately.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Forwarding Classes
- Forwarding Classes and Fabric Priority Queues
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Configuring Layer 2 Policers on IQE PICs
- Classifying Packets by Egress Interface

ieee-802.1 (Rewrite Rules on Logical Interface)

Syntax ieee-802.1 (*rewrite-name* | default) vlan-tag (outer | outer-and-inner);

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules]

Release Information Statement introduced before Junos OS Release 7.4.
vlan-tag statement introduced in Junos OS Release 8.1.

Description Apply an IEEE-802.1 rewrite rule. For IQ PICs, you can only configure one IEEE 802.1 rewrite rule on a physical port. All logical ports (units) on that physical port should apply the same IEEE 802.1 rewrite rule.

Options *rewrite-name*—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules ieee-802.1]** hierarchy level.

default—The default mapping.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Rewrite Rules
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- dscp (Rewrite Rules)
- dscp-ipv6 (Class-of-Service)
- exp
- exp-push-push-push
- exp-swap-push-push
- ieee-802.1ad
- inet-precedence
- rewrite-rules (Definition) on page 212

interfaces

Syntax interfaces { ... }

Hierarchy Level [edit]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure interfaces on the router.

Default The management and internal Ethernet interfaces are automatically configured. You must configure all other interfaces.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Physical Interface Configuration Statements Overview
- Configuring Aggregated Ethernet Link Protection

interface-set (Hierarchical Schedulers)

Syntax

```
interface-set interface-set-name {
  excess-bandwidth-share (proportional value | equal);
  internal-node;
  output-traffic-control-profile profile-name;
  output-traffic-control-profile-remaining profile-name;
}
```

Hierarchy Level [edit class-of-service interfaces]

Release Information Statement introduced in Junos OS Release 8.5.

Description For Enhanced Queuing DPC, MIC, or MPC interfaces on MX Series routers, or for IQ2E PIC interfaces on M Series and T Series routers, configure hierarchical schedulers for an interface set.

Options ***interface-set-name***—Name of the interface set.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring Interface Sets
- Configuring Hierarchical Schedulers for CoS

interface-set (Ethernet Interfaces)

Syntax

```
interface-set interface-set-name {
  interface ethernet-interface-name {
    (unit unit-number | vlan-tags-outer vlan-tag);
  }
}
```

Hierarchy Level [edit interfaces]

Release Information Statement introduced in Junos OS Release 8.5.

Description The set of interfaces used to configure hierarchical CoS schedulers on Ethernet interfaces on the MX Series router and IQ2E PIC on M Series and T Series routers.

The remaining statements are described separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Junos OS Class of Service Configuration Guide

loss-priority (Rewrite Rules)

Syntax loss-priority *level*;

Hierarchy Level [edit class-of-service rewrite-rules *type rewrite-name* forwarding-class *class-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Specify a loss priority to which to apply a rewrite rule. The rewrite rule sets the code-point aliases and bit patterns for a specific forwarding class and packet loss priority (PLP). The inputs for the map are the forwarding class and the PLP. The output of the map is the code-point alias or bit pattern.

Options *level* can be one of the following:

- **high**—The rewrite rule applies to packets with high loss priority.
- **low**—The rewrite rule applies to packets with low loss priority.
- **medium-high**—(For J Series routers only) The rewrite rule applies to packets with medium-high loss priority.
- **medium-low**—(For J Series routers only) The rewrite rule applies to packets with medium-low loss priority.

See Configuring Rewrite Rules, Overview of BA Classifier Types, Configuring Tricolor Marking, and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 80.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

loss-priority (BA Classifiers)

Syntax loss-priority *level*;

Hierarchy Level [edit class-of-service classifiers *type classifier-name* forwarding-class *class-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Specify packet loss priority value for a specific set of code-point aliases and bit patterns.

Options *level* can be one of the following:

- **high**—Packet has high loss priority.
- **medium-high**—Packet has medium-high loss priority.
- **medium-low**—Packet has medium-low loss priority.
- **low**—Packet has low loss priority.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Overview of BA Classifier Types
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Configuring Tricolor Marking

output-traffic-control-profile

Syntax output-traffic-control-profile *profile-name* shared-instance *instance-name*;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number*],
[edit class-of-service interfaces *interface-name* interface-set *interface-set-name*]

Release Information Statement introduced in Junos OS Release 7.6.
interface-set option added for Enhanced Queuing DPCs on MX Series routers in Junos OS Release 8.5.
interface-set option added for MIC and MPC interfaces on MX Series routers in Junos OS Release 10.2.

Description For Channelized IQ PIC interfaces, for Gigabit Ethernet IQ, Gigabit Ethernet IQ2, and IQ2E PIC interfaces, for link services IQ (LSQ) interfaces on AS PICs, and for Enhanced Queuing DPC, MIC, and MPC interfaces on MX Series routers, apply an output traffic scheduling and shaping profile to the logical interface.

The **shared-instance** statement is supported on Gigabit Ethernet IQ2 PICs only.

Options ***profile-name***—Name of the traffic-control profile to be applied to this interface

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Oversubscribing Interface Bandwidth
- Configuring Traffic Control Profiles for Shared Scheduling and Shaping
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- Configuring Hierarchical Schedulers for CoS (Enhanced Queuing DPC, MIC, and MPC interfaces on MX Series routers)
- Configuring Interface Sets (Enhanced Queuing DPC, MIC, and MPC interfaces on MX Series routers)
- output-traffic-control-profile-remaining
- **traffic-control-profiles on page 218**

policer (Configuring)

Syntax

```
policer policer-name {
  filter-specific;
  if-exceeding {
    bandwidth-limit bps;
    bandwidth-percent number;
    burst-size-limit bytes;
  }
  logical-bandwidth-policer;
  logical-interface-policer;
  physical-interface-policer;
  shared-bandwidth-policer;
  then {
    policer-action;
  }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall],
[edit firewall],
[edit logical-systems *logical-system-name* firewall]

Release Information

Statement introduced before Junos OS Release 7.4.
The **out-of-profile** policer action added in Junos OS Release 8.1.
The **logical-bandwidth-policer** statement added in Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.
The **physical-interface-policer** statement introduced in Junos OS Release 9.6.
The **shared-bandwidth-policer** statement added in Junos OS Release 11.2
Support at the **[edit dynamic-profiles ... firewall]** hierarchy level introduced in Junos OS Release 11.4.

Description

Configure policer rate limits and actions. When included at the **[edit firewall]** hierarchy level, the **policer** statement creates a template, and you do not have to configure a policer individually for every firewall filter or interface. To activate a policer, you must include the **policer-action** modifier in the **then** statement in a firewall filter term or on an interface.

Options

policer-action—One or more actions to take:

- **discard**—Discard traffic that exceeds the rate limits.
- **forwarding-class** *class-name*—Specify the particular forwarding class.
- **loss-priority**—Set the packet loss priority (PLP) to **low**, **medium-low**, **medium-high**, or **high**.
- **out-of-profile**—On J Series routers with strict priority queuing, prevent starvation of other queues by rate limiting the data stream entering the strict priority queue, marking the packets that exceed the rate limit as out-of-profile, and dropping the out-of-profile packets if the physical interface is congested.

policer-name—Name that identifies the policer. The name can contain letters, numbers, and hyphens (-), and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (“ ”). Policer names cannot begin with an underscore in the form **__.***.

then—Actions to take on matching packets.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Bandwidth Policer Overview
- Configuring Multifield Classifiers
- Logical Interface (Aggregate) Policer Overview
- Physical Interface Policer Overview
- Statement Hierarchy for Configuring Policers
- Single-Rate Two-Color Policer Overview
- Using Multifield Classifiers to Set PLP
- filter (Configuring) on page 201
- priority (Schedulers)

rewrite-rules (Definition)

Syntax

```
rewrite-rules {
  type rewrite-name{
    import (rewrite-name | default);
    forwarding-class class-name {
      loss-priority level code-point [ aliases ] [ bit-patterns ];
    }
  }
}
```

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before Junos OS Release 7.4.
ieee-802.1ad option introduced in Junos OS Release 9.2.

Description Specify a rewrite-rules mapping for the traffic that passes through all queues on the interface.

Options ***rewrite-name***—Name of a **rewrite-rules** mapping.

type—Traffic type.

Values: **dscp**, **dscp-ipv6**, **exp**, **frame-relay-de** (J Series routers only), **ieee-802.1**, **ieee-802.1ad**, **inet-precedence**

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Rewrite Rules
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- J Series router documentation

scheduler (Scheduler Map)

Syntax scheduler *scheduler-name*;

Hierarchy Level [edit class-of-service scheduler-maps *map-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.2 for ACX Series Routers.

Description Associate a scheduler with a scheduler map.

Options ***scheduler-name***—Name of the scheduler configuration block.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Schedulers
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

scheduler-maps (For Most Interface Types)

Syntax

```
scheduler-maps {
  map-name {
    forwarding-class class-name scheduler scheduler-name;
  }
}
```

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before Junos OS Release 7.4.

Description Specify a scheduler map name and associate it with the scheduler configuration and forwarding class.

Options ***map-name***—Name of the scheduler map.

The remaining statements are explained separately.

See Configuring Schedulers and "Example: Configuring CoS for a PBB Network on MX Series Routers" on page 80.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

scheduler-maps (For Most Interface Types)

Syntax

```
scheduler-maps {
  map-name {
    forwarding-class class-name scheduler scheduler-name;
  }
}
```

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before Junos OS Release 7.4.

Description Specify a scheduler map name and associate it with the scheduler configuration and forwarding class.

Options ***map-name***—Name of the scheduler map.

The remaining statements are explained separately.

See Configuring Schedulers and "Example: Configuring CoS for a PBB Network on MX Series Routers" on page 80.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

schedulers (Class of Service)

Syntax

```
schedulers {
  scheduler-name {
    adjust-minimum rate;
    adjust-percent percentage;
    buffer-size (seconds | percent percentage | remainder | temporal microseconds);
    drop-profile-map loss-priority (any | low | medium-low | medium-high | high) protocol
      (any | non-tcp | tcp) drop-profile profile-name;
    excess-priority [ low | medium-low | medium-high | high | none];
    excess-rate (percent percentage | proportion value);
    priority priority-level;
    shaping-rate (percent percentage | rate);
    transmit-rate (percent percentage | rate | remainder) <exact | rate-limit>;
  }
}
```

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series switches.

Description Specify the scheduler name and parameter values.

Options ***scheduler-name***—Name of the scheduler to be configured.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Schedulers Overview
- Default Schedulers Overview
- Configuring Schedulers
- Configuring a Scheduler
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

term (Firewall Filter)

Syntax

```
term term-name {
  from {
    match-conditions;
    ip-version ipv4 {
      match-conditions-mpls-ipv4-address;
        protocol (tcp | udp) {
          match conditions-mpls-ipv4-port;
        }
    }
  }
  then {
    actions;
  }
}
```

Hierarchy Level

[edit firewall family *family-name* filter *filter-name*],
[edit firewall family *family-name* service-filter *filter-name*],
[edit firewall family *family-name* simple-filter *filter-name*],
[edit logical-systems *logical-system-name* firewall family *family-name* filter *filter-name*],
[edit logical-systems *logical-system-name* firewall family *family-name* service-filter *filter-name*],
[edit logical-systems *logical-system-name* firewall family *family-name* simple-filter *filter-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
filter option introduced in Junos OS Release 7.6.
Logical systems support introduced in Junos OS Release 9.3.
ip-version ipv4 support introduced in Junos OS Release 10.1.

Description

Define a firewall filter term.

Options

actions—(Optional) Actions to perform on the packet if conditions match. You can specify one *terminating action* supported for the specified filter type. If you do not specify a terminating action, the packets that match the conditions in the **from** statement are accepted by default. As an option, you can specify one or more *nonterminating actions* supported for the specified filter type.

filter-name—(Optional) For **family *family-name* filter *filter-name*** only, reference another standard stateless firewall filter from within this term.

from—(Optional) Match packet fields to values. If not included, all packets are considered to match and the actions and action modifiers in the **then** statement are taken.

match-conditions—One or more conditions to use to make a match on a packet.

match-conditions-mpls-ipv4-address—(MPLS-tagged IPv4 traffic only) One or more IP address match conditions to match on the IPv4 packet header. Supports network-based service in a core network with IPv4 packets as an inner payload of an MPLS packet with labels stacked up to five deep.

match-conditions-mpls-ipv4-port—(MPLS-tagged IPv4 traffic only) One or more UDP or TCP port match conditions to use to match a packet in an MPLS flow. Supports network-based service in a core network with IPv4 packets as an inner payload of an MPLS packet with labels stacked up to five deep.

term-name—Name that identifies the term. The name can contain letters, numbers, and hyphens (-) and can be up to 64 characters long. To include spaces in the name, enclose it in quotation marks (“ ”).

then—(Optional) Actions to take on matching packets. If not included and a packet matches all the conditions in the **from** statement, the packet is accepted.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Guidelines for Configuring Standard Firewall Filters
- Guidelines for Configuring Service Filters
- Guidelines for Configuring Simple Filters
- Guidelines for Configuring and Applying Firewall Filters in Logical Systems

traffic-control-profiles

Syntax

traffic-control-profiles *profile-name* {
  adjust-minimum *rate*;
  atm-service (cbr | rtvbr | nrtvbr);
  delay-buffer-rate (percent *percentage* | *rate*);
  peak-rate *rate*;
  sustained-rate *rate*;
  max-burst-size *cells*;
  excess-rate (percent *percentage* | proportion *value*);
  excess-rate-high (percent *percentage* | proportion *value*);
  excess-rate-low (percent *percentage* | proportion *value*);
  guaranteed-rate (percent *percentage* | *rate*) <burst-size *bytes*>;
  overhead-accounting (frame-mode | cell-mode | frame-mode-bytes | cell-mode-bytes)
    <bytes (*byte-value*)>;
  scheduler-map *map-name*;
  shaping-rate (percent *percentage* | *rate*) <burst-size *bytes*>;
  shaping-rate-excess-high *rate* [burst-size *bytes*];
  shaping-rate-excess-low *rate* [burst-size *bytes*];
  shaping-rate-priority-high *rate* [burst-size *bytes*];
  shaping-rate-priority-low *rate* [burst-size *bytes*];
  shaping-rate-priority-medium *rate* [burst-size *bytes*];
}

Hierarchy Level [edit class-of-service]

Release Information Statement introduced in Junos OS Release 7.6.

Description For Gigabit Ethernet IQ, Channelized IQ PICs, FRF.15 and FRF.16 LSQ interfaces, and Enhanced Queuing (EQ) DPCs only, configure traffic shaping and scheduling profiles. For Enhanced EQ PICs and EQ DPCs only, you can include the **excess-rate** statement.

Options ***profile-name***—Name of the traffic-control profile.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Oversubscribing Interface Bandwidth
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80
- **output-traffic-control-profile on page 209**

transmit-rate (Schedulers)

Syntax transmit-rate (*rate* | percent *percentage* | remainder) <exact | rate-limit>;

Hierarchy Level [edit class-of-service schedulers *scheduler-name*]

Release Information Statement introduced before Junos OS Release 7.4.
rate-limit option introduced in Junos OS Release 8.3. Applied to the Multiservices PICs in Junos OS Release 9.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.
Statement introduced in Junos OS Release 12.2 for ACX Series Routers.

Description Specify the transmit rate or percentage for a scheduler.

Default If you do not include this statement, the default scheduler transmission rate and buffer size percentages for queues 0 through 7 are 95, 0, 0, 5, 0, 0, 0, and 0 percent, respectively.

Options **exact**—(Optional) Enforce the exact transmission rate. Under sustained congestion, a rate-controlled queue that goes into negative credit fills up and eventually drops packets. This value should never exceed the rate-controlled amount. For PTX Series Packet Transport Switches, this option is allowed only on the non-strict-high (high, medium-high, medium-low, or low) queues.

percent *percentage*—Percentage of transmission capacity. A percentage of zero drops all packets in the queue.

Range: 0 through 100 percent for M, MX and T Series routers; 1 through 100 percent for PTX Series Packet Transport Switches; 0 through 200 percent for the SONET/SDH OC48/STM16 IQE PIC

NOTE:

- On M Series Multiservice Edge Routers, for interfaces configured on 4-port E1 and 4-port T1 PICs only, you can configure a *percentage* value only from 11 through 100. These two PICs do not support transmission rates less than 11 percent.
- The configuration of the **transmit-rate percent 0 exact** statement at the **[edit class-of-service schedules *scheduler-name*]** hierarchy is ineffective on T4000 routers with Type 5 FPC.
- On MIC and MPC interfaces on MX Series routers, when the transmit rate is configured as a percentage and **exact** or **rate-limit** is enabled on a queue, the shaping rate of the parent node is used to compute the transmit rate. If **exact** or **rate-limit** is not configured, the guaranteed rate of the parent node is used to compute the transmit rate.

rate—Transmission rate, in bps. You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 3200 through 160,000,000,000 bps

NOTE: For all MX Series interfaces, the rate can be from 65,535 through 160,000,000,000 bps.

rate-limit—(Optional) Limit the transmission rate to the rate-controlled amount. In contrast to the **exact** option, the scheduler with the **rate-limit** option shares unused bandwidth above the rate-controlled amount.

NOTE: For PTX Series Packet Transport Switches, this option is allowed only on the strict-high queue. We recommend that you configure rate limit on strict-high queues because the other queues may not meet their guaranteed bandwidths.

NOTE: The configuration of the **rate-limit** statement is supported on T4000 routers only with a Type 5 FPC.

remainder—Use the remaining rate available.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Schedulers
- Configuring Scheduler Transmission Rate
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 80

CHAPTER 8

Interface Set Configuration Statements

This chapter lists the Interface Set configuration statements:

interface-set (Ethernet Interfaces)

Syntax

```
interface-set interface-set-name {
  interface ethernet-interface-name {
    (unit unit-number | vlan-tags-outer vlan-tag);
  }
}
```

Hierarchy Level [edit interfaces]

Release Information Statement introduced in Junos OS Release 8.5.

Description The set of interfaces used to configure hierarchical CoS schedulers on Ethernet interfaces on the MX Series router and IQ2E PIC on M Series and T Series routers.

The remaining statements are described separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
- Junos OS Class of Service Configuration Guide

interface-set (Hierarchical Schedulers)

Syntax

```
interface-set interface-set-name {
  excess-bandwidth-share (proportional value | equal);
  internal-node;
  output-traffic-control-profile profile-name;
  output-traffic-control-profile-remaining profile-name;
}
```

Hierarchy Level [edit class-of-service interfaces]

Release Information Statement introduced in Junos OS Release 8.5.

Description For Enhanced Queuing DPC, MIC, or MPC interfaces on MX Series routers, or for IQ2E PIC interfaces on M Series and T Series routers, configure hierarchical schedulers for an interface set.

Options ***interface-set-name***—Name of the interface set.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Interface Sets
- Configuring Hierarchical Schedulers for CoS

PART 3

Administration

- Provider Backbone Bridging Monitoring Commands on page 225
- CoS Monitoring Commands on page 265
- Connectivity Fault Management Monitoring Commands on page 289

CHAPTER 9

Provider Backbone Bridging Monitoring Commands

This chapter lists the PBB monitoring commands:

show bridge mac-table

Syntax

show bridge mac-table
<brief | count | detail | extensive>
<bridge-domain (all | *bridge-domain-name*)>
<global-count>
<interface *interface-name*>
<*mac-address*>
<vlan-id (all-vlan | *vlan-id*)>

Release Information

Command introduced in Junos OS Release 8.4.

Description

(MX Series routers only) Display Layer 2 MAC address information.

Options

none—Display all learned Layer 2 MAC address information.

brief | count | detail | extensive—(Optional) Display the specified level of output.

bridge-domain (all | *bridge-domain-name*)—(Optional) Display learned Layer 2 MAC addresses for all bridging domains or for the specified bridging domain.

global-count—(Optional) Display the total number of learned Layer 2 MAC addresses on the system.

instance *instance-name*—(Optional) Display learned Layer 2 MAC addresses for the specified routing instance.

interface *interface-name*—(Optional) Display learned Layer 2 MAC addresses for the specified interface.

mac-address—(Optional) Display the specified learned Layer 2 MAC address information.

vlan-id (all-vlan | *vlan-id*)—(Optional) Display learned Layer 2 MAC addresses for all VLANs or for the specified VLAN.

Additional Information

When Layer 2 protocol tunneling is enabled, the tunneling MAC address 01:00:0c:cd:cd:d0 is installed in the MAC table. When the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunk Protocol (VTP) is configured for Layer 2 protocol tunneling on an interface, the corresponding protocol MAC address is installed in the MAC table.

Required Privilege Level

view

List of Sample Output

show bridge mac-table on page 228
show bridge mac-table brief on page 228
show brief mac-table count on page 228
show bridge mac-table detail on page 228

Output Fields

Table 14 on page 227 describes the output fields for the **show bridge mac-table** command. Output fields are listed in the approximate order in which they appear.

Table 14: show bridge mac-table Output fields

Field Name	Field Description
Routing instance	Name of the routing instance.
Bridging domain	Name of the bridging domain.
MAC address	MAC address or addresses learned on a logical interface.
MAC flags	Status of MAC address learning properties for each interface: • **S**—Static MAC address is configured. • **D**—Dynamic MAC address is configured. • **SE**—MAC accounting is enabled. • **NM**—Non-configured MAC.
Logical interface	Name of the logical interface.
MAC count	Number of MAC addresses learned on the specific routing instance or interface.
Learning interface	Name of the logical interface on which the MAC address was learned.
Learning VLAN	VLAN ID of the routing instance or bridge domain in which the MAC address was learned.
Layer 2 flags	Debugging flags signifying that the MAC address is present in various lists.
Epoch	Spanning Tree Protocol epoch number identifying when the MAC address was learned. Used for debugging.
Sequence number	Sequence number assigned to this MAC address. Used for debugging.
Learning mask	Mask of the Packet Forwarding Engines where this MAC address was learned. Used for debugging.
IPC generation	Creation time of the logical interface when this MAC address was learned. Used for debugging.

Sample Output

show bridge mac-table

```
user@host> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : vs1
 Bridging domain : vlan100, VLAN : 100
   Learning  MAC                 MAC      Logical
   VLAN      address             flags    interface
             00:00:00:19:1c:db   D        ge-11/0/3.0
             00:00:00:59:3a:2f   D        xe-10/2/0.100
```

show bridge mac-table brief

```
user@host> show bridge mac-table brief
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : vs1
 Bridging domain : vlan100, VLAN : 100
   Learning  MAC                 MAC      Logical
   VLAN      address             flags    interface
             00:00:00:19:1c:db   D        ge-11/0/3.0
             00:00:00:59:3a:2f   D        xe-10/2/0.100
```

show brief mac-table count

```
user@host> show bridge mac-table count
2 MAC address learned in routing instance vs1 bridge domain vlan100

  MAC address count per interface within routing instance:
    Logical interface        MAC count
    ge-11/0/3.0                      1
    ge-11/1/4.100                    0
    ge-11/1/1.100                    0
    ge-11/1/0.100                    0
    xe-10/2/0.100                    1
    xe-10/0/0.100                    0

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID            MAC count
                0                    2

0 MAC address learned in routing instance vs1 bridge domain vlan200

  MAC address count per interface within routing instance:
    Logical interface        MAC count
    ge-11/1/0.200                    0
    ge-11/1/1.200                    0
    ge-11/1/4.200                    0
    xe-10/0/0.200                    0
    xe-10/2/0.200                    0

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID            MAC count
                0                    0
```

show bridge mac-table detail

```
user@host> show bridge mac-table detail
MAC address: 00:00:00:19:1c:db
  Routing instance: vs1
```

```
   Bridging domain: vlan100
   Learning interface: ge-11/0/3.0     Learning VLAN: 0
   Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
   Epoch: 4                            Sequence number: 0
   Learning mask: 0x800                IPC generation: 0

MAC address: 00:00:00:59:3a:2f
  Routing instance: vs1
   Bridging domain: vlan100
   Learning interface: xe-10/2/0.100   Learning VLAN: 0
   Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
   Epoch: 7                            Sequence number: 0
   Learning mask: 0x400                IPC generation: 0
```

show interfaces (Gigabit Ethernet)

Syntax

show interfaces ge-*fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced before Junos OS Release 7.4.

Description

(M Series, T Series, and MX Series routers only) Display status information about the specified Gigabit Ethernet interface.

Options

ge-*fpc/pic/port*—Display standard information about the specified Gigabit Ethernet interface.

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Additional Information

In a logical system, this command displays information only about the logical interfaces and not about the physical interfaces.

Required Privilege Level

view

Related Documentation

- Verifying and Managing Agent Circuit Identifier-Based Dynamic VLAN Configuration

List of Sample Output

show interfaces (Gigabit Ethernet) on page 246
show interfaces (Gigabit Ethernet on MX Series Routers) on page 246
show interfaces extensive (Gigabit Ethernet on MX Series Routers showing interface transmit statistics configuration) on page 246
show interfaces brief (Gigabit Ethernet) on page 248
show interfaces detail (Gigabit Ethernet) on page 248
show interfaces extensive (Gigabit Ethernet IQ2) on page 249
show interfaces (Gigabit Ethernet Unnumbered Interface) on page 252
show interfaces (ACI Interface Set Configured) on page 253

Output Fields

Table 15 on page 231 describes the output fields for the **show interfaces** (Gigabit Ethernet) command. Output fields are listed in the approximate order in which they appear. For Gigabit Ethernet IQ and IQE PICs, the traffic and MAC statistics vary by interface type. For more information, see Table 16 on page 244.

Table 15: show interfaces Gigabit Ethernet Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under Common Output Fields Description.	All levels
Interface index	Index number of the physical interface, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface.	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Loopback status: **Enabled** or **Disabled**. If loopback is enabled, type of loopback: **Local** or **Remote**.	All levels
Source filtering	Source filtering status: **Enabled** or **Disabled**.	All levels
LAN-PHY mode	10-Gigabit Ethernet interface operating in Local Area Network Physical Layer Device (LAN PHY) mode. LAN PHY allows 10-Gigabit Ethernet wide area links to use existing Ethernet applications.	All levels
WAN-PHY mode	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	All levels
Unidirectional	Unidirectional link mode status for 10-Gigabit Ethernet interface: **Enabled** or **Disabled** for parent interface; **Rx-only** or **Tx-only** for child interfaces.	All levels
Flow control	Flow control status: **Enabled** or **Disabled**.	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: **Enabled** or **Disabled**.	All levels
Remote-fault	(Gigabit Ethernet interfaces) Remote fault status: • **Online**—Autonegotiation is manually configured as online. • **Offline**—Autonegotiation is manually configured as offline.	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Link flags	Information about the link. Possible values are described in the “Links Flags” section under Common Output Fields Description.	All levels
Wavelength	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels
Frequency	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Schedulers	(Gigabit Ethernet intelligent queuing 2 [IQ2] interfaces only) Number of CoS schedulers configured.	**extensive**
Hold-times	Current interface hold-time up and hold-time down, in milliseconds (ms).	**detail extensive**
Current address	Configured MAC address.	**detail extensive** none
Hardware address	Hardware MAC address.	**detail extensive** none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped:** ***year-month-day hour:minute:second:timezone*** **(*hour:minute:second* ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago).**	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps).	None
Output Rate	Output rate in bps and pps.	None
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Traffic statistics	Number and rate of bytes and packets received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface. Gigabit Ethernet and 10-Gigabit Ethernet IQ PICs count the overhead and CRC bytes. For Gigabit Ethernet IQ PICs, the input byte counts vary by interface type. For more information, see Table 31 under the show interfaces (10-Gigabit Ethernet) command.	**detail extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Input errors	Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Errors**—Sum of the incoming frame aborts and FCS errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Framing errors**—Number of packets received with an invalid frame checksum (FCS). • **Runts**—Number of frames received that are smaller than the runt threshold. • **Policed discards**—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that Junos OS does not handle. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. L3 incomplete errors can be ignored by configuring the **ignore-l3-incompletes** statement. • **L2 channel errors**—Number of times the software did not find a valid logical interface for an incoming frame. • **L2 mismatch timeouts**—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • **FIFO errors**—Number of FIFO errors in the receive direction that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Output errors	Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Carrier transitions**—Number of times the interface has gone from **down** to **up**. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Collisions**—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number should always remain 0. If it is nonzero, there is a software bug. • **Aged packets**—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • **FIFO errors**—Number of FIFO errors in the send direction as reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **HS link CRC errors**—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • **MTU errors**—Number of packets whose size exceeded the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**
Egress queues	Total number of egress queues supported on the specified interface.	**detail extensive**
Queue counters (Egress)	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.	**detail extensive**
Ingress queues	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	**extensive**
Queue counters (Ingress)	CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Active alarms and Active defects	Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router, or turn on the red or yellow alarm LED on the craft interface. These fields can contain the value **None** or **Link**. • **None**—There are no active defects or alarms. • **Link**—Interface has lost its link state, which usually means that the cable is unplugged, the far-end system has been turned off, or the PIC is malfunctioning.	**detail extensive** none
Interface transmit statistics	(On MX Series devices) Status of the **interface-transmit-statistics** configuration: Enabled or Disabled. • **Enabled**—When the **interface-transmit-statistics** statement is included in the configuration. If this is configured, the interface statistics show the actual transmitted load on the interface. • **Disabled**—When the **interface-transmit-statistics** statement is not included in the configuration. If this is not configured, the interface statistics show the offered load on the interface.	**detail extensive**
OTN FEC statistics	The forward error correction (FEC) counters provide the following statistics: • **Corrected Errors**—The count of corrected errors in the last second. • **Corrected Error Ratio**—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits.	**detail extensive**
PCS statistics	(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device. • **Bit errors**—High bit error rate. Indicates the number of bit errors when the PCS receiver is operating in normal mode. • **Errored blocks**—Loss of block lock. The number of errored blocks when the PCS receiver is operating in normal mode.	**detail extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output

MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem, including the following:
	
	• **Total octets** and **total packets**—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see Table 31 under the show interfaces (10-Gigabit Ethernet) command.
	• **Unicast packets, Broadcast packets,** and **Multicast packets**—Number of unicast, broadcast, and multicast packets.
	• **CRC/Align errors**—Total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (Alignment Error).
	• **FIFO error**—Number of FIFO errors that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC or a cable is probably malfunctioning.
	• **MAC control frames**—Number of MAC control frames.
	• **MAC pause frames**—Number of MAC control frames with **pause** operational code.
	• **Oversized frames**—There are two possible conditions regarding the number of oversized frames:
	  ◦ Packet length exceeds 1518 octets, or
	  ◦ Packet length exceeds MRU
	• **Jabber frames**—Number of frames that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. 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 in which any packet exceeds 20 ms. The allowed range to detect jabber is from 20 ms to 150 ms.
	• **Fragment frames**—Total number of packets that were less than 64 octets in length (excluding framing bits, but including FCS octets) and had either an FCS error or an alignment error. Fragment frames normally increment because both runts (which are normal occurrences caused by collisions) and noise hits are counted.
	• **VLAN tagged frames**—Number of frames that are VLAN tagged. The system uses the TPID of 0x8100 in the frame to determine whether a frame is tagged or not.
	
	NOTE: The 20-port Gigabit Ethernet MIC (MIC-3D-20GE-SFP) does not have hardware counters for VLAN frames. Therefore, the **VLAN tagged frames** field displays 0 when the **show interfaces** command is executed on a 20-port Gigabit Ethernet MIC. In other words, the number of VLAN tagged frames cannot be determined for the 20-port Gigabit Ethernet MIC.
	
	• **Code violations**—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."
		extensive

OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	**extensive**
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Filter statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem. The filtering is done by the content-addressable memory (CAM) on the PIC. The filter examines a packet's source and destination MAC addresses to determine whether the packet should enter the system or be rejected. • **Input packet count**—Number of packets received from the MAC hardware that the filter processed. • **Input packet rejects**—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • **Input DA rejects**—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the router from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local router (which the router is rejecting). • **Input SA rejects**—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field should increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • **Output packet count**—Number of packets that the filter has given to the MAC hardware. • **Output packet pad count**—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • **Output packet error count**—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. • **CAM destination filters, CAM source filters**—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields should be 0.	**extensive**
PMA PHY	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **PHY Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
WIS section	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOL**—Loss of light • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • **SES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)	**extensive**
WIS line	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-L**—Remote error indication (near-end line) • **RDI-L**—Remote defect indication (near-end line) • **AIS-L**—Alarm indication signal (near-end line) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **ES-L**—Errored seconds (near-end line) • **SES-L**—Severely errored seconds (near-end line) • **UAS-L**—Unavailable seconds (near-end line) • **ES-LFE**—Errored seconds (far-end line) • **SES-LFE**—Severely errored seconds (far-end line) • **UAS-LFE**—Unavailable seconds (far-end line)	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
WIS path	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B3**—Bit interleaved parity for SONET section overhead • **REI-P**—Remote error indication • **LOP-P**—Loss of pointer (path) • **AIS-P**—Path alarm indication signal • **RDI-P**—Path remote defect indication • **UNEQ-P**—Path unequipped • **PLM-P**—Path payload (signal) label mismatch • **ES-P**—Errored seconds (near-end STS path) • **SES-P**—Severely errored seconds (near-end STS path) • **UAS-P**—Unavailable seconds (near-end STS path) • **SES-PFE**—Severely errored seconds (far-end STS path) • **UAS-PFE**—Unavailable seconds (far-end STS path)	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output

Autonegotiation information	Information about link autonegotiation.
	• **Negotiation status:**
	  ◦ **Incomplete**—Ethernet interface has the speed or link mode configured.
	  ◦ **No autonegotiation**—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation.
	  ◦ **Complete**—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner status**—**OK** when Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner**—Information from the remote Ethernet device:
	  ◦ **Link mode**—Depending on the capability of the link partner, either **Full-duplex** or **Half-duplex**.
	  ◦ **Flow control**—Types of flow control supported by the link partner. For Gigabit Ethernet interfaces, types are **Symmetric** (link partner supports **PAUSE** on receive and transmit), **Asymmetric** (link partner supports **PAUSE** on transmit), **Symmetric/Asymmetric** (link partner supports **PAUSE** on receive and transmit or only **PAUSE** on transmit), and **None** (link partner does not support flow control).
	  ◦ **Remote fault**—Remote fault information from the link partner—**Failure** indicates a receive link error. **OK** indicates that the link partner is receiving. **Negotiation error** indicates a negotiation error. **Offline** indicates that the link partner is going offline.
	• **Local resolution**—Information from the local Ethernet device:
	  ◦ **Flow control**—Types of flow control supported by the local device. For Gigabit Ethernet interfaces, advertised capabilities are **Symmetric/Asymmetric** (local device supports **PAUSE** on receive and transmit or only **PAUSE** on receive) and **None** (local device does not support flow control). Depending on the result of the negotiation with the link partner, local resolution flow control type will display **Symmetric** (local device supports **PAUSE** on receive and transmit), **Asymmetric** (local device supports **PAUSE** on receive), and **None** (local device does not support flow control).
	  ◦ **Remote fault**—Remote fault information. **Link OK** (no error detected on receive), **Offline** (local interface is offline), and **Link Failure** (link error detected on receive).
		extensive

Received path trace, Transmitted path trace	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the router at the other end of the fiber. The transmitted path trace value is the message that this router transmits.	**extensive**
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface. • **CoS transmit queue**—Queue number and its associated user-configured forwarding class name. • **Bandwidth %**—Percentage of bandwidth allocated to the queue. • **Bandwidth bps**—Bandwidth allocated to the queue (in bps). • **Buffer %**—Percentage of buffer space allocated to the queue. • **Buffer usec**—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • **Priority**—Queue priority: **low** or **high**. • **Limit**—Displayed if rate limiting is configured for the queue. Possible values are **none** and **exact**. If **exact** is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If **none** is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.	**extensive**
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Index number of the logical interface, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP interface index number for the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Flags	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under Common Output Fields Description.	All levels

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
VLAN-Tag	Rewrite profile applied to incoming or outgoing frames on the outer (**Out**) VLAN tag or for both the outer and inner (**In**) VLAN tags. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **pop**—The outer VLAN tag of the incoming frame is removed. • **swap**—The outer VLAN tag of the incoming frame is overwritten with the user-specified VLAN tag information. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **push-push**—Two VLAN tags are pushed in from the incoming frame. • **swap-push**—The outer VLAN tag of the incoming frame is replaced by a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame. • **swap-swap**—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user-specified VLAN tag value. • **pop-swap**—The outer VLAN tag of the incoming frame is removed, and the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame. • **pop-pop**—Both the outer and inner VLAN tags of the incoming frame are removed.	**brief detail extensive** none
Demux	IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following: • Source Family Inet • Destination Family Inet	**detail extensive** none
Encapsulation	Encapsulation on the logical interface.	All levels
ACI VLAN: Dynamic Profile	Name of the dynamic profile that defines the agent circuit identifier (ACI) interface set. If configured, the ACI interface set enables the underlying Ethernet interface to create dynamic VLAN subscriber interfaces based on ACI information.	**brief detail extensive** none
Protocol	Protocol family. Possible values are described in the “Protocol Field” section under Common Output Fields Description.	**detail extensive** none
MTU	Maximum transmission unit size on the logical interface.	**detail extensive** none
Dynamic Profile	(MX Series routers with Trio MPCs only) Name of the dynamic profile that was used to create this interface configured with a Point-to-Point Protocol over Ethernet (PPPoE) family.	**detail extensive** none
Service Name Table	(MX Series routers with Trio MPCs only) Name of the service name table for the interface configured with a PPPoE family.	**detail extensive** none
Max Sessions	(MX Series routers with Trio MPCs only) Maximum number of PPPoE logical interfaces that can be activated on the underlying interface.	**detail extensive** none

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Duplicate Protection	(MX Series routers with Trio MPCs only) State of PPPoE duplicate protection: **On** or **Off**. When duplicate protection is configured for the underlying interface, a dynamic PPPoE logical interface cannot be activated when an existing active logical interface is present for the same PPPoE client.	**detail extensive** none
Maximum labels	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	**detail extensive** none
Traffic statistics	Number and rate of bytes and packets received and transmitted on the specified interface set. • **Input bytes, Output bytes**—Number of bytes received and transmitted on the interface set • **Input packets, Output packets**—Number of packets received and transmitted on the interface set.	**detail extensive**
IPv6 transit statistics	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled.	**extensive**
Local statistics	Number and rate of bytes and packets destined to the router.	**extensive**
Transit statistics	Number and rate of bytes and packets transiting the switch. NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the **Output bytes** and **Output packets** interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.	**extensive**
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route Table	Route table in which the logical interface address is located. For example, **0** refers to the routing table inet.0.	**detail extensive** none
Flags	Information about protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	**detail extensive**
Donor interface	(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.	**detail extensive** none
Preferred source address	(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.	**detail extensive** none
Input Filters	Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parentheses next to all interfaces.	**detail extensive**

Table 15: show interfaces Gigabit Ethernet Output Fields *(continued)*

Field Name	Field Description	Level of Output
Output Filters	Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parentheses next to all interfaces.	**detail extensive**
Mac-Validate Failures	Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	**detail extensive** none
protocol-family	Protocol family configured on the logical interface. If the protocol is **inet**, the IP address of the interface is also displayed.	**brief**
Flags	Information about the address flag. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	**detail extensive** none
Destination	IP address of the remote side of the connection.	**detail extensive** none
Local	IP address of the logical interface.	**detail extensive** none
Broadcast	Broadcast address of the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Table 16: Gigabit Ethernet IQ PIC Traffic and MAC Statistics by Interface Type

Interface Type	Sample Command	Byte and Octet Counts Include	Comments
Inbound physical interface	**show interfaces ge-0/3/0 extensive**	Traffic statistics: Input bytes: 496 bytes per packet, representing the Layer 2 packet MAC statistics: Received octets: 500 bytes per packet, representing the Layer 2 packet + 4 bytes	The additional 4 bytes are for the CRC.
Inbound logical interface	**show interfaces ge-0/3/0.50 extensive**	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	
Outbound physical interface	**show interfaces ge-0/0/0 extensive**	Traffic statistics: Input bytes: 490 bytes per packet, representing the Layer 3 packet + 12 bytes MAC statistics: Received octets: 478 bytes per packet, representing the Layer 3 packet	For input bytes, the additional 12 bytes include 6 bytes for the destination MAC address plus 4 bytes for VLAN plus 2 bytes for the Ethernet type.

Table 16: Gigabit Ethernet IQ PIC Traffic and MAC Statistics by Interface Type *(continued)*

Interface Type	Sample Command	Byte and Octet Counts Include	Comments
Outbound logical interface	**show interfaces ge-0/0/0.50 extensive**	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	

Sample Output

show interfaces (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 35
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues     : 4 supported, 4 maximum usable queues
  Current address: 00:05:85:4a:e9:7c, Hardware address: 00:05:85:4a:e9:7c
  Last flapped   : 2006-08-10 17:25:10 PDT (00:01:08 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Ingress rate at Packet Forwarding Engine      : 0 bps (0 pps)
  Ingress drop rate at Packet Forwarding Engine : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None

  Logical interface ge-3/0/2.0 (Index 72) (SNMP ifIndex 69)
    Flags: SNMP-Traps 0x4000
    VLAN-Tag [ 0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530) Out(swap-push
    0x8100.512 0x8100.513)
    Encapsulation: VLAN-CCC
    Input packets : 0
    Output packets: 0
    Protocol ccc, MTU: 1522
      Flags: Is-Primary
```

show interfaces (Gigabit Ethernet on MX Series Routers)

```
user@host> show interfaces ge-2/2/2
Physical interface: ge-2/2/2, Enabled, Physical link is Up
  Interface index: 156, SNMP ifIndex: 188
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, MAC-REWRITE Error: None,
 Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Schedulers     : 0
  Current address: 00:1f:12:b7:d7:c0, Hardware address: 00:1f:12:b7:d6:76
  Last flapped   : 2008-09-05 16:44:30 PDT (3d 01:04 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  Logical interface ge-2/2/2.0 (Index 82) (SNMP ifIndex 219)
    Flags: SNMP-Traps 0x20000000 Encapsulation: Ethernet-Bridge
    Input packets : 0
    Output packets: 0
     Protocol aenet, AE bundle: ae0.0    Link Index: 4
```

show interfaces extensive (Gigabit

```
user@host> show interfaces ge-2/1/2 extensive | match "output|interface"
Physical interface: ge-2/1/2, Enabled, Physical link is Up
  Interface index: 151, SNMP ifIndex: 530, Generation: 154
```

Ethernet on MX Series Routers showing interface transmit

```
Interface flags: SNMP-Traps Internal: 0x4000
 Output bytes  :         240614363944            772721536 bps
 Output packets:           3538446506              1420444 pps
  Direction : Output
```

statistics configuration)

```
  Interface transmit statistics: Enabled

  Logical interface ge-2/1/2.0 (Index 331) (SNMP ifIndex 955) (Generation 146)
     Output bytes  :         195560312716            522726272 bps
     Output packets:           4251311146              1420451 pps
```

show interfaces brief (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2 brief
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None

  Logical interface ge-3/0/2.0
    Flags: SNMP-Traps 0x4000
    VLAN-Tag [ 0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530) Out(swap-push
    0x8100.512 0x8100.513)
    Encapsulation: VLAN-CCC
    ccc

  Logical interface ge-3/0/2.32767
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2
```

show interfaces detail (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2 detail
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 35, Generation: 177
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 4 supported, 4 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:4a:e9:7c, Hardware address: 00:05:85:4a:e9:7c
  Last flapped   : 2006-08-09 17:17:00 PDT (01:31:33 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
  Ingress traffic statistics at Packet Forwarding Engine:
   Input  bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Drop   bytes  :                    0                    0 bps
   Drop   packets:                    0                    0 pps
  Ingress queues: 4 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0
```



```
  Egress queues: 4 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0

  Active alarms  : None
  Active defects : None

  Logical interface ge-3/0/2.0 (Index 72) (SNMP ifIndex 69) (Generation 140)
    Flags: SNMP-Traps 0x4000
    VLAN-Tag [0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530)
Out(swap-push 0x8100.512 0x8100.513)
    Encapsulation: VLAN-CCC
    Traffic statistics:
     Input  bytes  :                  0
     Output bytes  :                  0
     Input  packets:                  0
     Output packets:                  0
    Local statistics:
     Input  bytes  :                  0
     Output bytes  :                  0
     Input  packets:                  0
     Output packets:                  0
    Transit statistics:
     Input  bytes  :                  0                   0 bps
     Output bytes  :                  0                   0 bps
     Input  packets:                  0                   0 pps
     Output packets:                  0                   0 pps
    Protocol ccc, MTU: 1522, Generation: 149, Route table: 0
      Flags: Is-Primary

  Logical interface ge-3/0/2.32767 (Index 71) (SNMP ifIndex 70)
  (Generation 139)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                  0
     Output bytes  :                  0
     Input  packets:                  0
     Output packets:                  0
    Local statistics:
     Input  bytes  :                  0
     Output bytes  :                  0
     Input  packets:                  0
     Output packets:                  0
    Transit statistics:
     Input  bytes  :                  0                   0 bps
     Output bytes  :                  0                   0 bps
     Input  packets:                  0                   0 pps
     Output packets:                  0                   0 pps
```

show interfaces extensive (Gigabit Ethernet IQ2)

```
user@host> show interfaces ge-7/1/3 extensive
Physical interface: ge-7/1/3, Enabled, Physical link is Up
  Interface index: 170, SNMP ifIndex: 70, Generation: 171
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
```



```
Remote fault: Online
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4004000
Link flags     : None
CoS queues     : 8 supported, 4 maximum usable queues
Schedulers     : 256
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:14:f6:30:5e:74, Hardware address: 00:14:f6:30:5e:74
Last flapped   : 2007-11-07 21:31:41 PST (02:03:33 ago)
Statistics last cleared: Never
Traffic statistics:
 Input  bytes  :          38910844056                7952 bps
 Output bytes  :              7174605                8464 bps
 Input  packets:            418398473                  11 pps
 Output packets:                78903                  12 pps
 IPv6 transit statistics:
  Input  bytes  :                   0
  Output bytes  :                   0
  Input  packets:                   0
  Output packets:                   0
Ingress traffic statistics at Packet Forwarding Engine:
 Input  bytes  :          38910799145                7952 bps
 Input  packets:            418397956                  11 pps
 Drop   bytes  :                    0                   0 bps
 Drop   packets:                    0                   0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  FIFO errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,

  FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
Ingress queues: 4 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort           418390823            418390823                    0

  1 expedited-fo                  0                    0                    0

  2 assured-forw                  0                    0                    0

  3 network-cont               7133                 7133                    0

Egress queues: 4 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort                1031                 1031                    0

  1 expedited-fo                  0                    0                    0

  2 assured-forw                  0                    0                    0

  3 network-cont              77872                77872                    0

Active alarms  : None
Active defects : None
MAC statistics:                      Receive         Transmit
  Total octets                   38910844056          7174605
  Total packets                    418398473            78903
  Unicast packets               408021893366             1026
```



```
    Broadcast packets                    10              12
    Multicast packets             418398217           77865
    CRC/Align errors                      0               0
    FIFO errors                           0               0
    MAC control frames                    0               0
    MAC pause frames                      0               0
    Oversized frames                      0
    Jabber frames                         0
    Fragment frames                       0
    VLAN tagged frames                    0
    Code violations                       0  OTN Received Overhead Bytes:
    APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58
    Payload Type: 0x08
  OTN Transmitted Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x08
  Filter statistics:
    Input packet count            418398473
    Input packet rejects                479
    Input DA rejects                    479
    Input SA rejects                      0
    Output packet count                                   78903
    Output packet pad count                                   0
    Output packet error count                                 0
    CAM destination filters: 0, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Complete
    Link partner:
        Link mode: Full-duplex, Flow control: Symmetric/Asymmetric,
        Remote fault: OK
    Local resolution:
        Flow control: Symmetric, Remote fault: Link OK
  Packet Forwarding Engine configuration:
    Destination slot: 7
  CoS information:
    Direction : Output
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %            bps     %           usec
    0 best-effort            95      950000000    95              0
low    none
    3 network-control         5       50000000     5              0
low    none
    Direction : Input
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %            bps     %           usec
    0 best-effort            95      950000000    95              0
low    none
    3 network-control         5       50000000     5              0
low    none

  Logical interface ge-7/1/3.0 (Index 70) (SNMP ifIndex 85) (Generation 150)
    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :              812400
     Output bytes  :             1349206
     Input  packets:                9429
     Output packets:                9449
     IPv6 transit statistics:
      Input  bytes  :                  0
      Output bytes  :                  0
      Input  packets:                  0
```

```
      Output packets:                   0
    Local statistics:
     Input  bytes  :               812400
     Output bytes  :              1349206
     Input  packets:                 9429
     Output packets:                 9449
    Transit statistics:
     Input  bytes  :                    0                  7440 bps
     Output bytes  :                    0                  7888 bps
     Input  packets:                    0                    10 pps
     Output packets:                    0                    11 pps
     IPv6 transit statistics:
      Input  bytes  :                   0
      Output bytes  :                   0
      Input  packets:                   0
      Output packets:                   0
    Protocol inet, MTU: 1500, Generation: 169, Route table: 0
      Flags: Is-Primary, Mac-Validate-Strict
      Mac-Validate Failures: Packets: 0, Bytes: 0
      Addresses, Flags: Is-Preferred Is-Primary
      Input Filters: F1-ge-3/0/1.0-in, F3-ge-3/0/1.0-in
      Output Filters: F2-ge-3/0/1.0-out (53)
      Destination: 10.74.2/24, Local: 10.74.2.2, Broadcast: 10.74.2.255,
        Generation: 196
    Protocol multiservice, MTU: Unlimited, Generation: 170, Route table: 0
      Flags: Is-Primary
      Policer: Input: __default_arp_policer__
```

NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics displayed in the **show interfaces** command output might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the interface counters. For detailed information, see the description of the logical interface **Transit statistics** fields in Table 15 on page 231.

show interfaces (Gigabit Ethernet

```
user@host> show interfaces ge-3/2/0
Physical interface: ge-3/2/0, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 50
```


Unnumbered Interface)

```
Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
Remote fault: Online
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : None
CoS queues     : 8 supported, 4 maximum usable queues
Current address: 00:14:f6:11:26:f8, Hardware address: 00:14:f6:11:26:f8
Last flapped   : 2006-10-27 04:42:23 PDT (08:01:52 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 624 bps (1 pps)
Active alarms  : None
Active defects : None

Logical interface ge-3/2/0.0 (Index 67) (SNMP ifIndex 85)
  Flags: SNMP-Traps Encapsulation: ENET2
  Input packets : 0
  Output packets: 6
  Protocol inet, MTU: 1500
    Flags: Unnumbered
    Donor interface: lo0.0 (Index 64)
    Preferred source address: 22.22.22.22
```

show interfaces (ACI Interface Set Configured)

```
user@host> show interfaces ge-1/0/0.4001
  Logical interface ge-1/0/0.4001 (Index 340) (SNMP ifIndex 548)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.4001 ]  Encapsulation: PPP-over-

    Ethernet
    ACI VLAN:
      Dynamic Profile: aci-vlan-set-profile
    PPPoE:
      Dynamic Profile: aci-vlan-pppoe-profile,
      Service Name Table: None,
      Max Sessions: 32000, Max Sessions VSA Ignore: Off,
      Duplicate Protection: On, Short Cycle Protection: Off,
      AC Name: nbc
    Input packets : 9
    Output packets: 8
    Protocol multiservice, MTU: Unlimited
```

show l2-learning backbone-instance

Syntax

show l2–learning backbone-instance
<*bridge-domain-name*>
<isid [*isid-number*] all-isid>
<instance [*instance-name*]>
<logical-system [*system-name* | all]>

Release Information (MX Series routers only) Command introduced in JUNOS Release 10.0.

Description Displays the remote backbone edge bridges in a PBBN network.

Options

bridge-domain-name—(Optional) Display information for a specified bridge domain.

isid *isid-number*—(Optional) Display MAC addresses learned on a specified service identifier (I-SID). The I-SID value can be from **256** through **16777215**.

all-isid—Display MAC addresses learned on all I-SIDs.

instance*instance-name*—(Optional) Display information for a specified instance.

logical-system [*system-name* | all]—(Optional) Display information for a specified logical system or all systems.

Required Privilege Level view

Related Documentation

- show l2-learning remote-backbone-edge-bridge on page 262
- show l2-learning provider-instance on page 258
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

List of Sample Output

show l2-learning backbone-instance on page 256
show l2-learning backbone-instance instance on page 256
show l2-learning backbone-instance isid on page 256
show l2-learning backbone-instance logical-system on page 257

Output Fields Table 17 on page 254 describes the output fields for the **show l2-learning instance** command. Output fields are listed in the approximate order in which they appear.

Table 17: show l2-learning instance Output Fields

Field Name	Field Description
PBN Routing Instance	Name of PBN routing instance.
bridging domain	Name of bridging domain.
Index	Number associated with the routing instance or bridging domain.

Table 17: show l2-learning instance Output Fields *(continued)*

Field Name	Field Description
Logical System	Name of the logical system or **Default** if no logical system is configured.
Routing instance flags	Status of Layer 2 learning properties for each routing instance: • **P2P**—Point-to-point service (E-LINE). • **MP**—Multi-point service (E-LAN). • **M1**—Many service VLANS (S-VLANs) to one I-SID. • **O1**—One S-VLAN to one I-SID. This field is not yet supported and reserved for a future release.
MAC limit	Maximum number of MAC addresses that can be learned from each interface in the routing instance or bridging domain.

Sample Output

show l2-learning backbone-instance

```
user@host> show l2-learning backbone-instance
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN  Flags     Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
300       vin1              bd1               100     M1,MP     01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN  Flags     Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
301       vin1              bd101             101     M1,MP     01:1e:86:00:01:2d
```

show l2-learning backbone-instance instance

```
user@host> show l2-learning backbone-instance vin2
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN  Flags     Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
300       vin1              bd1               100     M1,MP     01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN  Flags     Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
301       vin1              bd101             101     M1,MP     01:1e:86:00:01:2d
```

show l2-learning backbone-instance isid

```
user@host> show l2-learning backbone-instance isid 301
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,         MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN  Flags     Backbone
```

```
          Routing          Bridging                         Destination
          Instance         Domain                           MAC
301       vin1             bd101            101     M1,MP   01:1e:86:00:01:2d
```

show l2-learning backbone-instance logical-system

user@host> **show l2-learning backbone-instance logical-system all**

```
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,        MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN              Provider         S-VLAN  Flags   Backbone
          Routing          Bridging                         Destination
          Instance         Domain                           MAC
300       vin1             bd1              100     M1,MP   01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,        MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN              Provider         S-VLAN  Flags   Backbone
          Routing          Bridging                         Destination
          Instance         Domain                           MAC
301       vin1             bd101            101     M1,MP   01:1e:86:00:01:2d
```


show l2-learning provider-instance

Syntax

show l2-learning provider-instance
<isid [*isid-number*] all-isid>
<instance [*instance-name*]>
<logical-system [*system-name* | all]>

Release Information

(MX-series routers only) Command introduced in Junos Release 10.0.

Description

Displays the provider instance (I-component).

Options

none—Display information for all authenticator ports.

isid ***isid-number***—(Optional) Display MAC addresses learned on a specified service identifier (I-SID). The I-SID value can be from **256** through **16777215**.

all-isid—Display MAC addresses learned on all I-SIDs.

instance***instance-name***—(Optional) Display information for a specified instance.

logical-system [*system-name* | all]—(Optional) Display information for a specified logical system or all systems.

Required Privilege Level

view

Related Documentation

- show l2-learning backbone-instance on page 254
- show l2-learning remote-backbone-edge-bridge on page 262
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

List of Sample Output

show l2-learning provider-instance on page 260
show l2-learning provider-instance instance on page 260
show l2-learning provider-instance isid on page 260
show l2-learning provider-instance instance logical-system on page 260

Output Fields

Table 18 on page 258 describes the output fields for the **show l2-learning instance** command. Output fields are listed in the approximate order in which they appear.

Table 18: show l2-learning instance Output Fields

Field Name	Field Description
PBN Routing Instance	Name of the PBN routing instance.
bridging domain	Name of the bridging domain.
Index	Number associated with the routing instance or bridging domain.
Logical System	Name of the logical system or **Default** if no logical system is configured.

Table 18: show l2-learning instance Output Fields *(continued)*

Field Name	Field Description
Routing instance flags	Status of the Layer 2 learning properties for each routing instance: • **P2P**—Point-to-point service (E-LINE). • **MP**—Multi-point service (E-LAN). • **M1**—Many service VLANS (S-VLANs) to one I-SID. • **O1**—One S-VLAN to one I-SID.
MAC limit	Maximum number of MAC addresses that can be learned from each interface in the routing instance or bridging domain.

Sample Output

show l2-learning provider-instance

```
user@host> show l2-learning provider-instance
PBN Routing Instance: pbn-3-for-elan
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                 S-VLAN   ISID       PBBN            B-VLAN   Flags
Bridging                                Bridging
Domain                                  Domain
elan-svlans-vlan-1300 1300 10300        elan-bvlan      3350     M1,MP
elan-svlans-vlan-1400 1400 10400        elan-bvlan      3350     M1,MP

PBN Routing Instance: pbn-3-for-eline
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                 S-VLAN   ISID       PBBN            B-VLAN   Flags
Bridging                                Bridging
Domain                                  Domain
eline-svlans-vlan-1200 1200 10200       eline-bvlan     3150     M1,P2P
eline-svlans-vlan-2100 2100 10100       eline-bvlan     3150     M1,P2P
```

show l2-learning provider-instance instance

```
user@host> show l2-learning provider-instance instance vin1
PBN Routing Instance: vin1
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                 S-VLAN   ISID       PBBN            B-VLAN   Flags
Bridging                                Bridging
Domain                                  Domain
bd1                 100      300        bd2             200      M1,MP
bd101               101      301        bd201           201      M1,MP
```

show l2-learning provider-instance isid

```
user@host> show l2-learning provider-instance isid 300
PBN Routing Instance: vin1
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN                 S-VLAN   ISID       PBBN            B-VLAN   Flags
Bridging                                Bridging
Domain                                  Domain
bd1                 100      300        bd2             200      M1,MP
```

show l2-learning provider-instance

```
user@host> show l2-learning provider-instance logical-system all
PBN Routing Instance: vin1
Flags (P2P -ELINE service,         MP -ELAN service,
```

instance logical-system

```
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN               S-VLAN   ISID       PBBN             B-VLAN  Flags
Bridging                              Bridging
Domain                                Domain
bd1               100      300        bd2              200     M1,MP
bd101             101      301        bd201            201     M1,MP
```

```
user@host> show l2-learning provider-instance logical-system bd1
PBN Routing Instance: vin1
Flags (P2P -ELINE service,         MP -ELAN service,
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN               S-VLAN   ISID       PBBN             B-VLAN  Flags
Bridging                              Bridging
Domain                                Domain
bd1               100      300        bd2              200     M1,MP
```

show l2-learning remote-backbone-edge-bridge

Syntax

show l2–learning remote-backbone-edge-bridge
<*remote-beb-mac-address*>
<instance [*instance-name*]>
<logical-system [*system-name* | all]>

Release Information

(MX-series routers only) Command introduced in Junos Release 10.0.

Description

Displays the remote backbone edge bridges in a PBBN network.

Options

remote-beb-mac-address—(Optional) Display information for a remote backbone edge brigde MAC address.

instance*instance-name*—(Optional) Display information for a specified instance.

logical-system [*system-name* | all]—(Optional) Display information for a specified logical system or all systems.

Required Privilege Level

view

Related Documentation

- show l2-learning provider-instance on page 258
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

List of Sample Output

show l2-learning backbone-instance on page 264
show l2-learning remote backbone edge bridge instance on page 264
show l2-learning remote backbone edge bridge logical-system on page 264

Output Fields

Table 19 on page 262 describes the output fields for the **show l2-learning instance** command. Output fields are listed in the approximate order in which they appear.

Table 19: show l2-learning instance Output Fields

Field Name	Field Description
PBN Routing Instance	Name of the PBN routing instance.
bridging domain	Name of the bridging domain.
Index	Number associated with the routing instance or bridging domain.
Logical System	Name of the logical system or **Default** if no logical system is configured.

Table 19: show l2-learning instance Output Fields *(continued)*

Field Name	Field Description
Routing instance flags	Status of Layer 2 learning properties for each routing instance: • **P2P**—Point-to-point service (E-LINE). • **MP**—Multi-point service (E-LAN). • **M1**—Many service VLANS (S-VLANs) to one I-SID. • **O1**—One S-VLAN to one I-SID.
MAC limit	Maximum number of MAC addresses that can be learned from each interface in the routing instance or bridging domain.

Sample Output

show l2-learning backbone-instance

```
user@host> show l2-learning backbone-instance
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,        MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN   Flags    Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
300       vin1              bd1               100      M1,MP    01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,        MP -ELAN service)
       M1  -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN               Provider          S-VLAN   Flags    Backbone
          Routing           Bridging                            Destination
          Instance          Domain                              MAC
301       vin1              bd101             101      M1,MP    01:1e:86:00:01:2d
```

show l2-learning remote backbone edge bridge instance

```
user@host> show l2-learning remote-backbone-edge-bridge instance vin2
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : vin2

   RBEB MAC                Time before       Flags
   Address                 expiry (SS:MS)
   00:aa:00:00:00:00             :
```

show l2-learning remote backbone edge bridge logical-system

```
user@host> show l2-learning remote-backbone-edge-bridge logical-system all
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : vin2

   RBEB MAC                Time before       Flags
   Address                 expiry (SS:MS)
   00:aa:00:00:00:00             :
```


CHAPTER 10

CoS Monitoring Commands

This chapter lists the CoS monitoring commands:

show class-of-service scheduler-map

Syntax

show class-of-service scheduler-map
<*name*>

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 11.1 for the QFX Series.

Description

Display the mapping of schedulers to forwarding classes and a summary of scheduler parameters for each entry.

Options

none—Display all scheduler maps.

name—(Optional) Display a summary of scheduler parameters for each forwarding class to which the named scheduler is assigned.

Required Privilege Level

view

List of Sample Output

show class-of-service scheduler-map on page 267

Output Fields

Table 20 on page 266 describes the output fields for the **show class-of-service scheduler-map** command. Output fields are listed in the approximate order in which they appear.

Table 20: show class-of-service scheduler-map Output Fields

Field Name	Field Description
Scheduler map	Name of the scheduler map.
Index	Index of the indicated object. Objects having indexes in this output include scheduler maps, schedulers, and drop profiles.
Scheduler	Name of the scheduler.
Forwarding class	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router.
Transmit rate	Configured transmit rate of the scheduler (in bps). The rate is a percentage of the total interface bandwidth, or the keyword **remainder**, which indicates that the scheduler receives the remaining bandwidth of the interface.
Rate Limit	Rate limiting configuration of the queue. Possible values are **none**, meaning no rate limiting, and **exact**, meaning the queue only transmits at the configured rate.
Maximum buffer delay	Amount of transmit delay (in milliseconds) or the buffer size of the queue. The buffer size is shown as a percentage of the total interface buffer allocation, or by the keyword **remainder** to indicate that the buffer is sized according to what remains after other scheduler buffer allocations.
Priority	Scheduling priority: **low** or **high**.

Table 20: show class-of-service scheduler-map Output Fields *(continued)*

Field Name	Field Description
Excess priority	Priority of excess bandwidth: **low**, **medium-low**, **medium-high**, **high**, or **none**.
Adjust minimum	Minimum shaping rate for an adjusted queue, in bps.
Adjust percent	Bandwidth adjustment applied to a queue, in percent.
Drop profiles	Table displaying the assignment of drop profiles by name and index to a given loss priority and protocol pair.
Loss priority	Packet loss priority for drop profile assignment.
Protocol	Transport protocol for drop profile assignment.
Name	Name of the drop profile.

Sample Output

show class-of-service scheduler-map

```
user@host> show class-of-service scheduler-map
Scheduler map: dd-scheduler-map, Index: 84

  Scheduler: aa-scheduler, Index: 8721, Forwarding class: aa-forwarding-class
   Transmit rate: 30 percent, Rate Limit: none, Maximum buffer delay: 39 ms,
   Priority: high
   Drop profiles:
    Loss priority    Protocol    Index    Name
     Low             non-TCP     8724     aa-drop-profile
     Low             TCP         9874     bb-drop-profile
     High            non-TCP     8833     cc-drop-profile
     High            TCP         8484     dd-drop-profile

  Scheduler: bb-scheduler, Forwarding class: aa-forwarding-class
   Transmit rate: 40 percent, Rate limit: none, Maximum buffer delay: 68 ms,
   Priority: high
   Drop profiles:
    Loss priority    Protocol    Index    Name
     Low             non-TCP     8724     aa-drop-profile
     Low             TCP         9874     bb-drop-profile
     High            non-TCP     8833     cc-drop-profile
     High            TCP         8484     dd-drop-profile
```

show class-of-service traffic-control-profile

Syntax

show class-of-service traffic-control-profile
<*profile-name*>

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Command introduced in Junos OS Release 12.2 for ACX Series Routers.

Description

For Gigabit Ethernet IQ PICs, Channelized IQ PICs, EQ DPCs, and Trio MPC/MIC interfaces only, display traffic shaping and scheduling profiles.

(ACX Series routers) For ATM IMA pseudowire interfaces, display traffic shaping and scheduling profiles.

Options

none—Display all profiles.

profile-name—(Optional) Display information about a single profile.

Required Privilege Level

view

List of Sample Output

show class-of-service traffic-control-profile on page 270
show class-of-service traffic-control-profile (MX Series routers with Clear Channel Multi-Rate CE MIC) on page 270
show class-of-service traffic-control-profile (ACX Series routers with ATM IMA pseudowire interfaces) on page 270

Output Fields

Table 21 on page 268 describes the output fields for the **show class-of-service traffic-control-profile** command. Output fields are listed in the approximate order in which they appear.

Table 21: show class-of-service traffic-control-profile Output Fields

Field Name	Field Description
Traffic control profile	Name of the traffic control profile.
Index	Index number of the traffic control profile.
ATM Service	(MX Series routers with ATM Multi-Rate CE MIC) Configured category of ATM service. Possible values: • cbr—Constant bit rate. • rtvbr—Real time variable bit rate. • nrtvbr—Non real time variable bit rate. • ubr—Unspecified bit rate.
Maximum Burst Size	Configured maximum burst size, in cells.
Peak rate	Configured peak rate, in cps.

Table 21: show class-of-service traffic-control-profile Output Fields *(continued)*

Field Name	Field Description
Sustained rate	Configured sustained rate, in cps.
Shaping rate	Configured shaping rate, in bps. NOTE: (MX Series routers with ATM Multi-Rate CE MIC) Configured peak rate, in cps.
Shaping rate burst	Configured burst size for the shaping rate, in bytes. NOTE: (MX Series routers with ATM Multi-Rate CE MIC) Configured maximum burst rate, in cells.
Shaping rate priority high	Configured shaping rate for high-priority traffic, in bps.
Shaping rate priority medium	Configured shaping rate for medium-priority traffic, in bps.
Shaping rate priority low	Configured shaping rate for low-priority traffic, in bps.
Shaping rate excess high	Configured shaping rate for high-priority excess traffic, in bps.
Shaping rate excess low	Configured shaping rate for low-priority excess traffic, in bps.
Scheduler map	Name of the associated scheduler map.
Delay Buffer rate	Configured delay buffer rate, in bps.
Excess rate	Configured excess rate, in percent or proportion.
Excess rate high	Configured excess rate for high priority traffic, in percent or proportion.
Excess rate low	Configured excess rate for low priority traffic, in percent or proportion.
Guaranteed rate	Configured guaranteed rate, in bps or cps. NOTE: (MX Series routers with ATM Multi-Rate CE MIC) This value depends on the ATM service category chosen. Possible values: • **cbr**—Guaranteed rate is equal to the configured peak rate in cps. • **rtvbr**—Guaranteed rate is equal to the configured sustained rate in cps. • **nrtvbr**—Guaranteed rate is equal to the configured sustained rate in cps.
Guaranteed rate burst	Configured burst size for the guaranteed rate, in bytes.
adjust-minimum	Configured minimum shaping rate for an adjusted queue, in bps.

Table 21: show class-of-service traffic-control-profile Output Fields *(continued)*

Field Name	Field Description
overhead accounting mode	Configured shaping mode: **Frame Mode** or **Cell Mode**.
Overhead bytes	Configured byte adjustment value.

Sample Output

show class-of-service traffic-control-profile

```
user@host> show class-of-service traffic-control-profile
Traffic control profile: Profile1, Index: 57625
  Scheduler map: m1
  Delay Buffer rate: 500000
  Guaranteed rate: 1000000

Traffic control profile: Profile2, Index: 57624
  Scheduler map: m2
  Delay Buffer rate: 600000
  Guaranteed rate: 2000000

Traffic control profile: Profile3, Index: 57627
  Scheduler map: m3
  Delay Buffer rate: 800000
  Guaranteed rate: 3000000
 .Excess rate high: proportion 4

Traffic control profile: Profile4, Index: 57626
  Scheduler map: m4
  Delay Buffer rate: 750000
  Guaranteed rate: 4000000
..adjust-minimum 20000000
```

show class-of-service traffic-control-profile (MX Series routers with Clear Channel Multi-Rate CE MIC)

```
user@host> show class-of-service traffic-control-profile
Traffic control profile: at-vbr1, Index: 11395
  ATM Service: RTVBR
  Scheduler map: m3
  overhead accounting mode: Frame Mode
  Shaping rate: 1000 cps
  Shaping rate burst: 500 cells
  Delay Buffer rate: 2000 cps
  Guaranteed rate: 1000 cps

Traffic control profile: foo, Index: 38286
  ATM Service: UBR
  Scheduler map: m3
  overhead accounting mode: Frame Mode
```

show class-of-service traffic-control-profile (ACX Series routers

```
user@host> show class-of-service traffic-control-profile
Traffic control profile: foo, Index: 38286
  ATM Service: RTVBR
  Shaping rate: 2000 cps
```


with ATM IMA pseudowire interfaces)

```
Shaping rate burst: 200 cells
Scheduler map: <default>
Delay Buffer rate: 1000 cps
Guaranteed rate: 1700 cps
```

show firewall

Syntax

show firewall
<counter *counter-name*>
<filter *filter-name*>
<log>
<logical-system (all | *logical-system-name*)>
<terse>

Syntax (EX Series Switches)

show firewall
<counter *counter-name*>
<detail>
<filter *filter-name*>
<log <(detail | interface *interface-name*)>>
<policer counters <(detail | counter-id *counter-index* <detail>)>>
<terse>

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
logical-system option introduced in Junos OS Release 9.3.
terse option introduced in Junos OS Release 9.4.
policer counters option introduced in Junos OS Release 12.2 for EX Series switches.
detail option introduced in Junos OS Release 12.3.

Description

Display statistics about configured firewall filters.

Options

none—(Optional) Display statistics about all configured firewall filters and counters. For EX Series switches, this command also displays statistics about all configured policers.

counter *counter-name*—(Optional) Name of a filter counter.

detail—(EX Series switches only) (Optional) Display firewall filter statistics with enhanced policer.

filter *filter-name*—(Optional) Name of a configured filter.

logical-system (all | *logical-system-name*)—(Optional) Perform this operation on all logical systems or on a particular logical system.

log—(Optional) Display log entries for firewall filters.

log <(detail | interface *interface-name*)>—(EX Series switches only) (Optional) Display detailed log entries of firewall activity or log information about a specific interface.

policer counters <(detail | counter-id *counter-index* <detail>)>—(EX8200 switches only) (Optional) Display policer counter statistics in brief or in detail.

terse—(Optional) Display firewall filter names only.

Required Privilege Level

view

Related Documentation

- clear firewall
- show firewall log
- Verifying That Firewall Filters Are Operational
- Verifying That Policers Are Operational

List of Sample Output

show firewall filter (MX Series) on page 275
show firewall filter (non MX Series Router) on page 275
show firewall filter (Hierarchical Policer, MX Series with MPC) on page 275
show firewall filter (Dynamic Input Filter) on page 275
show firewall (Logical Systems) on page 275
show firewall (counter counter-name) on page 276
show firewall log on page 276
show firewall policer counters (EX8200 Switch) on page 276
show firewall policer counters (detail) (EX8200 Switch) on page 277
show firewall policer counters (counter-id counter-index) (EX8200 Switch) on page 277
show firewall policer counters (counter-id counter-index detail) (EX8200 Switch) on page 277
show firewall detail on page 278

Output Fields

Table 22 on page 273 lists the output fields for the **show firewall** command. Output fields are listed in the approximate order in which they appear.

Table 22: show firewall Output Fields

Field Name	Field Description
Filter	Name of a filter that has been configured with the **filter** statement at the **[edit firewall]** hierarchy level. Except on EX Series switches: • When an interface-specific filter is displayed, the name of the filter is followed by the full interface name and by either **-i** for an input filter or **-o** for an output filter. • When dynamic filters are displayed, the name of the filter is followed by the full interface name and by either **-in** for an input filter or **-out** for an output filter. When a logical system–specific filter is displayed, the name of the filter is prefixed with two underscore (__) characters and the name of the logical system (for example, **__ls1/filter1**). • When a service filter is displayed that uses a service set, the separator between the service-set name and the service-filter name is a semicolon (:).
Counters	Display filter counter information: • **Name**—Name of a filter counter that has been configured with the **counter** firewall filter action. • **Bytes**—Number of bytes that match the filter term under which the **counter** action is specified. • **Packets**—Number of packets that matched the filter term under which the **counter** action is specified.

Table 22: show firewall Output Fields *(continued)*

Field Name	Field Description
Policers	Display policer information: • **Name**—Name of policer. • **Bytes**—(For two-color policers on MX Series routers, and for hierarchical policers on interfaces hosted on MICs and MPCs in MX Series routers) Number of bytes that match the filter term under which the policer action is specified. This is only the number out-of-specification (out-of-spec) byte counts, not all the bytes in all packets policed by the policer. For other platforms, this field is blank. • **Packets**—Number of packets that matched the filter term under which the policer action is specified. This is only the number of out-of-specification (out-of-spec) packet counts, not all packets policed by the policer.
Policer Counter Index	(EX8200 switch only) Global management counter ID. The counter ID value (*counter-index*) can be 0, 1, or 2.
Green	(EX8200 switch only) Number of packets within the limits. The number of packets is smaller than the committed information rate (CIR).
Yellow	(EX8200 switch only) Number of packets partially within the limits. The number of packets is greater than the CIR, but the burst size is within the excess burst size (EBS) limit.
Discard	(EX8200 switch only) Number of discarded packets.
Bytes	(EX8200 switch only) Number of green, yellow, red, or discarded packets in bytes.
Packets	(EX8200 switch only) Number of green, yellow, red, or discarded packets.
Filter name	(EX8200 switch only) Name of the filter with a term associated to a policer.
Term name	(EX8200 switch only) Name of the term associated with a policer.
Policer name	(EX8200 switch only) Name of the policer that is associated with a global management counter.

Sample Output

show firewall filter (MX Series)

```
user@host> show firewall filter test
Filter: test
Counters:
Name                             Bytes              Packets
Counter-1                            0                    0
Counter-2                            0                    0
Policers:
Name                             Bytes              Packets
Policer-1                         2770                   70
```

show firewall filter (non MX Series Router)

```
user@host> show firewall filter test
Filter: test
Counters:
Name                             Bytes              Packets
Counter-1                            0                    0
Counter-2                            0                    0
Policers:
Name                             Bytes              Packets
Policer-1                                                70
```

show firewall filter (Hierarchical Policer, MX Series with MPC)

```
user@host> show firewall filter
FL_V4_PHY-HP-EF-AWARE-Gold=400k-MCAST=200k-Total=1M-ds-10/0/0:2:1-i

Filter: FL_V4_PHY-HP-EF-AWARE-Gold=400k-MCAST=200k-Total=1M-ds-10/0/0:2:1-i
Counters:
Name                                                Bytes              Packets
AF1x_counter-ds-10/0/0:2:1-i                            0                    0
AF2x_counter-ds-10/0/0:2:1-i                  25529445976             24500428
AF3x_counter-ds-10/0/0:2:1-i                      2182022                39482
AF4x_counter-ds-10/0/0:2:1-i                            0                    0
BE_counter-ds-10/0/0:2:1-i                              0                    0
EF_counter-ds-10/0/0:2:1-i                    14817044120             12265765
STD_counter-ds-10/0/0:2:1-i                             0                    0
Policers:
Name                                                Bytes              Packets
POL_CE-PE_M=200k-filter-ds-10/0/0:2:1-i        5948099658              5708349
POL_CE-PE_G=400K_R=1M-filter-ds-10/0/0:2:1-i   ??????????              3572794
???????????                                    ??????????              ???????
```

show firewall filter (Dynamic Input Filter)

```
user@host> show firewall filter dfwd-ge-5/0/0.1-in
Filter: dfwd-ge-5/0/0.1-in
Counters:
Name                                                Bytes              Packets
c1-ge-5/0/0.1-in                                        0                    0
```

show firewall (Logical Systems)

```
user@host> show firewall

Filter: __lr1/test
Counters:
Name                                                Bytes              Packets
icmp                                                  420                    5
Filter: __default_bpdu_filter__
```

```
Filter: __lr1/inet_filter1
Counters:
Name                                                Bytes              Packets
inet_tcp_count                                          0                    0
inet_udp_count                                          0                    0
Filter: __lr1/inet_filter2
Counters:
Name                                                Bytes              Packets
inet_icmp_count                                         0                    0
inet_pim_count                                          0                    0
Filter: __lr2/inet_filter1
Counters:
Name                                                Bytes              Packets
inet_tcp_count                                          0                    0
inet_udp_count                                          0                    0
```

show firewall (counter counter-name)

```
user@host> show firewall counter icmp-counter
Filter: ingress-port-voip-class-filter
Counters:
Name                                                Bytes              Packets
icmp-counter                                            0                    0
```

show firewall log

```
user@host> show firewall log
Log :

Time      Filter    Action Interface     Protocol        Src Addr
          Dest Addr
08:00:53  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
        192.168.3.4
08:00:52  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
         192.168.3.4
08:00:51  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
         192.168.3.4
08:00:50  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
         192.168.3.4
08:00:49  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
         192.168.3.4
08:00:48  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
         192.168.3.4
08:00:47  pfe        R      ge-1/0/1.0    ICMP            192.168.3.5
         192.168.3.4
```

show firewall policer counters (EX8200 Switch)

```
user@switch> show firewall policer counters
Policer Counter Index 0:
                          Bytes            Packets
Green:                       73              15914
Yellow:                       9               1962
Discard:                    119              25942

Policer Counter Index 1:
                           Bytes            Packets
Green:                         0                  0
Yellow:                        0                  0
Discard:                       0                  0

Policer Counter Index 2:
                           Bytes            Packets
```



```
Green:                          0                  0
Yellow:                         0                  0
Discard:                        0                  0
```

show firewall policer counters (detail) (EX8200 Switch)

```
user@switch> show firewall policer counters detail
Policer Counter Index 0:
                          Bytes            Packets
Green:                       73              15914
Yellow:                       9               1962
Discard:                    119              25942

Filter name                Term name           Policer name
myfilter                   polcr-term-1        myfilter-polcr-1
inet-filter-ae             ae-snmp             policer-1
inet-filter-ae             ae-ssh              policer-2

Policer Counter Index 1:
                          Bytes            Packets
Green:                        0                  0
Yellow:                       0                  0
Discard:                      0                  0

Filter name                Term name           Policer name

Policer Counter Index 2:
                          Bytes            Packets
Green:                        0                  0
Yellow:                       0                  0
Discard:                      0                  0

Filter name                Term name           Policer name
```

show firewall policer counters (counter-id counter-index) (EX8200 Switch)

```
user@switch> show firewall policer counters counter-id 0
Policer Counter Index 0:
                          Bytes            Packets
Green:                       73              15914
Yellow:                       9               1962
Discard:                    119              25942
```

show firewall policer counters (counter-id

```
user@switch> show firewall policer counters counter-id 0 detail
Policer Counter Index 0:
                          Bytes            Packets
```

counter-index detail) (EX8200 Switch)

```
Green:                        73            15914
Yellow:                        9             1962
Discard:                     119            25942

Filter name                Term name          Policer name
myfilter                   polcr-term-1       myfilter-polcr-1
inet-filter-ae             ae-snmp            policer-1
inet-filter-ae             ae-ssh             policer-2
```

show firewall detail

```
user@host> show firewall detail
Filter: __default_bpdu_filter__

Filter: foo
Counters:
Name                                                Bytes              Packets
c1                                               17652140               160474
Policers:
Name                                                Bytes              Packets
P1-t1
    OOS                                                 0                18286
    Offered                                             0 18446744073709376546
    Transmitted                                         0 18446744073709358260
```


show interfaces interface-set queue

Syntax
show interfaces interface-set queue *interface-set-name*
<aggregate | remaining-traffic>
<forwarding-class *class-name*>

Release Information Command introduced in Junos OS Release 8.5.

Description Display information about the gigabit or 10-Gigabit Ethernet interface set queue. Supported in MX Series routers with enhanced queuing DPCs.

Options

interface-set-name—(Optional) Display information about the specified gigabit or 10-Gigabit Ethernet interface set. Wildcard values can be used in the interface set name.

aggregate—(Optional) Display the aggregated queuing statistics of all member logical interfaces for interface sets that have traffic-control profiles configured.

both-ingress-egress—(Optional) On Gigabit Ethernet Intelligent Queuing 2 (IQ2) PICs, display both ingress and egress queue statistics.

egress—(Optional) Display egress queue statistics.

forwarding-class *class-name*—(Optional) Display queuing statistics for the specified forwarding class.

ingress—(Optional) On Gigabit Ethernet IQ2 PICs, display ingress queue statistics.

remaining-traffic—(Optional) Display the queuing statistics of all member logical interfaces for interface sets that do not have traffic-control profiles configured.

Required Privilege Level view

Related Documentation

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

List of Sample Output

show interfaces interface-set queue (Gigabit Ethernet) on page 281
show interfaces interface-set queue both-ingress-egress (Enhanced DPC) on page 281
show interfaces interface-set queue egress (Enhanced DPC) on page 283
show interfaces interface-set queue forwarding-class (Gigabit Ethernet) on page 285
show interfaces interface-set queue (Enhanced DPC) on page 286
show interfaces interface-set queue remaining-traffic (Gigabit Ethernet) on page 287

Output Fields Table 23 on page 280 describes the information for the **show interfaces interface-set queue** command.

Table 23: Ethernet show interfaces interface-set queue Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Interface set	Name of the interface set.	All levels
Interface set index	Index number of the interface set.	All levels
Forwarding classes supported	Total number of forwarding classes supported on the specified interface set.	All levels
Forwarding classes in use	Total number of forwarding classes used on the specified interface set.	All levels
Egress queues supported	Total number of egress queues supported on the specified interface set.	All levels
Egress queues in use	Total number of egress queues used on the specified interface set.	All levels
Ingress queues supported	Total number of ingress queues supported on the specified interface set.	All levels
Ingress queues in use	Total number of ingress queues used on the specified interface set.	All levels
Queue	Egress or ingress queue number for the statistics being displayed.	All levels
Forwarding classes	Forwarding class name for the statistics being displayed.	All levels
Queued	**Packet** and **Byte** statistics for the specified queue. • **Packets**—Number of packets queued and input rate in packets per second. • **Bytes**—Number of bytes queued and input rate in bytes per second.	All levels
Transmitted	**Packet** and **Byte** statistics for the specified forwarding class. • **Packets**—Number of packets transmitted and transmit rate in packets per second. • **Bytes**—Number of bytes transmitted and transmit rate in bytes per second. • **Tail-dropped packets**—Number of packets tail dropped. • **RED-dropped packets**—Number of RED-dropped packets for the **low**, **medium-low**, **medium-high**, and **high** loss priorities. • **RED-dropped bytes**—Number of RED-dropped bytes for the **low**, **medium-low**, **medium-high**, and **high** loss priorities.	All levels

Sample Output

show interfaces interface-set queue (Gigabit Ethernet)

```
user@host> show interfaces interface-set queue ge-2/2/0-0
Interface set: ge-2/2/0-0
  Interface set index: 3
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :             3998482                   1 pps
    Bytes                :           271896884                 688 bps
  Transmitted:
    Packets              :             1077474                   1 pps
    Bytes                :            73268340                 688 bps
    Tail-dropped packets :                   0                   0 pps
    RED-dropped packets  :             2921008                   0 pps
     Low                 :             2921008                   0 pps
     Medium-low          :                   0                   0 pps
     Medium-high         :                   0                   0 pps
     High                :                   0                   0 pps
    RED-dropped bytes    :           198628544                   0 bps
     Low                 :           198628544                   0 bps
     Medium-low          :                   0                   0 bps
     Medium-high         :                   0                   0 bps
     High                :                   0                   0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                   0                   0 pps
    Bytes                :                   0                   0 bps
  Transmitted:
...
```

show interfaces interface-set queue

```
user@host> show interfaces interface-set queue ge-2/2/0-0 both-ingress-egress
Interface set: ge-2/2/0-0
  Interface set index: 3
```

both-ingress-egress (Enhanced DPC)

```
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :             185968478                473161 pps
    Bytes                :           10042313520             204441336 bps
  Transmitted:
    Packets              :               5441673                 13780 pps
    Bytes                :             293850342               5952960 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :             180526772                459372 pps
    RED-dropped bytes    :            9748446282             198451512 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :             522021472                473602 pps
    Bytes                :           28190332480             204599944 bps
  Transmitted:
    Packets              :               5791772                  4055 pps
    Bytes                :             312755688               1751976 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :             516227139                469546 pps
    RED-dropped bytes    :           27876265560             202843872 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :               5417304                 13797 pps
    Bytes                :             368429508               7506096 bps
  Transmitted:
    Packets              :               5014996                 12769 pps
    Bytes                :             341019728               6946560 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                402189                  1028 pps
     Low                 :                402189                  1028 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :              27348852                559536 bps
     Low                 :              27348852                559536 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
```



```
     High              :              0              0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets            :              0              0 pps
    Bytes              :              0              0 bps
  Transmitted:
    Packets            :              0              0 pps
    Bytes              :              0              0 bps
    Tail-dropped packets :            0              0 pps
    RED-dropped packets  :            0              0 pps
     Low               :              0              0 pps
     Medium-low        :              0              0 pps
     Medium-high       :              0              0 pps
     High              :              0              0 pps
    RED-dropped bytes  :              0              0 bps
     Low               :              0              0 bps
     Medium-low        :              0              0 bps
     Medium-high       :              0              0 bps
     High              :              0              0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets            :        5770534           3963 pps
    Bytes              :      396943252        2156144 bps
  Transmitted:
    Packets            :        3945152           1457 pps
    Bytes              :      268270336         792608 bps
    Tail-dropped packets :            0              0 pps
    RED-dropped packets  :      1815141           2506 pps
     Low               :        1815141           2506 pps
     Medium-low        :              0              0 pps
     Medium-high       :              0              0 pps
     High              :              0              0 pps
    RED-dropped bytes  :      123429524        1363536 bps
     Low               :      123429524        1363536 bps
     Medium-low        :              0              0 bps
     Medium-high       :              0              0 bps
     High              :              0              0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets            :              0              0 pps
    Bytes              :              0              0 bps
  Transmitted:
    Packets            :              0              0 pps
    Bytes              :              0              0 bps
    Tail-dropped packets :            0              0 pps
    RED-dropped packets  :            0              0 pps
     Low               :              0              0 pps
     Medium-low        :              0              0 pps
     Medium-high       :              0              0 pps
     High              :              0              0 pps
    RED-dropped bytes  :              0              0 bps
     Low               :              0              0 bps
     Medium-low        :              0              0 bps
     Medium-high       :              0              0 bps
     High              :              0              0 bps
```

show interfaces interface-set queue

```
user@host> show interfaces interface-set queue ge-2/2/0-0 egress
Interface set: ge-2/2/0-0
  Interface set index: 3
```

egress (Enhanced DPC)

```
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :               3958253                 13822 pps
    Bytes                :             269217592               7519712 bps
  Transmitted:
    Packets              :               3665035                 12729 pps
    Bytes                :             249222380               6924848 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                293091                  1093 pps
     Low                 :                293091                  1093 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :              19930188                594864 bps
     Low                 :              19930188                594864 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
     High                :                     0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low                 :                     0                     0 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low                 :                     0                     0 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
     High                :                     0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :               5350989                  3904 pps
    Bytes                :             368412924               2124048 bps
  Transmitted:
    Packets              :               3790469                  1465 pps
    Bytes                :             257751892                796960 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :               1550282                  2439 pps
     Low                 :               1550282                  2439 pps
     Medium-low          :                     0                     0 pps
     Medium-high         :                     0                     0 pps
     High                :                     0                     0 pps
    RED-dropped bytes    :             105419176               1327088 bps
     Low                 :             105419176               1327088 bps
     Medium-low          :                     0                     0 bps
     Medium-high         :                     0                     0 bps
     High                :                     0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
```

```
Packets             :              0                     0 pps
Bytes               :              0                     0 bps
Tail-dropped packets :             0                     0 pps
RED-dropped packets  :             0                     0 pps
 Low                :              0                     0 pps
 Medium-low         :              0                     0 pps
 Medium-high        :              0                     0 pps
 High               :              0                     0 pps
RED-dropped bytes   :              0                     0 bps
 Low                :              0                     0 bps
 Medium-low         :              0                     0 bps
 Medium-high        :              0                     0 bps
 High               :              0                     0 bps
```

show interfaces interface-set queue

user@host> **show interfaces interface-set queue ge-2/2/0-0 forwarding-class best-effort**

```
Interface set: ge-2/2/0-0
  Interface set index: 3
```

forwarding-class (Gigabit Ethernet)

```
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :           101857694           1420083 pps
    Bytes                :          6927234456         772532320 bps
  Transmitted:
    Packets              :             3984693             55500 pps
    Bytes                :           270959592          30192512 bps
    Tail-dropped packets :                   0                 0 pps
    RED-dropped packets  :            97870952           1364583 pps
     Low                 :            97870952           1364583 pps
     Medium-low          :                   0                 0 pps
     Medium-high         :                   0                 0 pps
     High                :                   0                 0 pps
    RED-dropped bytes    :          6655225776         742339808 bps
     Low                 :          6655225776         742339808 bps
     Medium-low          :                   0                 0 bps
     Medium-high         :                   0                 0 bps
     High                :                   0                 0 bps
```

show interfaces interface-set queue (Enhanced DPC)

```
user@host> show interfaces interface-set queue ge-2/2/0-0 ingress
Interface set: foo
  Interface set index: 3
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :           149036817            473711 pps
    Bytes                :          8048003934         204642936 bps
  Transmitted:
    Packets              :             4360749             13891 pps
    Bytes                :           235480446           6000912 bps
    Tail-dropped packets :                   0                 0 pps
    RED-dropped packets  :           144676035            459820 pps
    RED-dropped bytes    :          7812506592         198642024 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                   0                 0 pps
    Bytes                :                   0                 0 bps
  Transmitted:
    Packets              :                   0                 0 pps
    Bytes                :                   0                 0 bps
    Tail-dropped packets :                   0                 0 pps
    RED-dropped packets  :                   0                 0 pps
    RED-dropped bytes    :                   0                 0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :           485089207            473605 pps
    Bytes                :         26195987476         204597576 bps
  Transmitted:
    Packets              :             5480799              3959 pps
    Bytes                :           295963146           1710504 bps
    Tail-dropped packets :                   0                 0 pps
    RED-dropped packets  :           479605853            469646 pps
    RED-dropped bytes    :         25898716170         202887072 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                   0                 0 pps
    Bytes                :                   0                 0 bps
  Transmitted:
```

```
    Packets              :                 0                 0 pps
    Bytes                :                 0                 0 bps
    Tail-dropped packets :                 0                 0 pps
    RED-dropped packets  :                 0                 0 pps
    RED-dropped bytes    :                 0                 0 bps
```

show interfaces interface-set queue remaining-traffic (Gigabit Ethernet)

```
user@host> show interfaces interface-set queue ge-2/2/0-0 remaining-traffic
Interface set: ge-2/2/0-0
  Interface set index: 12
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :           2201552                 0 pps
    Bytes                :         149705536                 0 bps
  Transmitted:
    Packets              :            609765                 0 pps
    Bytes                :          41464020                 0 bps
    Tail-dropped packets :                 0                 0 pps
    RED-dropped packets  :           1591787                 0 pps
     Low                 :           1591787                 0 pps
     Medium-low          :                 0                 0 pps
     Medium-high         :                 0                 0 pps
     High                :                 0                 0 pps
    RED-dropped bytes    :         108241516                 0 bps
     Low                 :         108241516                 0 bps
     Medium-low          :                 0                 0 bps
     Medium-high         :                 0                 0 bps
     High                :                 0                 0 bps
```


CHAPTER 11

Connectivity Fault Management Monitoring Commands

This chapter lists the CFM monitoring commands:

show class-of-service interface-set

Syntax

show class-of-service interface-set
<*interface-set-name*>

Release Information

Command introduced in Junos OS Release 9.4.

Description

Display the configured shaping rate and the adjusted shaping rate for each logical interface set configured for hierarchical class of service (CoS).

Options

none—Display CoS associations for all logical interface sets.

interface-set ***interface-set-name***—(Optional) Display CoS associations for the specified interface set.

Required Privilege Level

view

List of Sample Output

show class-of-service interface-set on page 291

Output Fields

Table 24 on page 290 describes the output fields for the **show class-of-service interface-set** command. Output fields are listed in the approximate order in which they appear.

Table 24: show class-of-service interface-set Output Fields

Field Name	Field Description
Interface-set	Name of a logical interface set composed of one or more logical interfaces for which hierarchical scheduling is enabled.
Index	Index number of this interface set or the internal index number of this object.
Physical interface	Name of a physical interface.
Queues supported	Number of queues you can configure on the interface.
Queues in use	Number of queues currently configured.
Output traffic control profile	Name of the output traffic-control profile attached to the logical interface set.

Table 24: show class-of-service interface-set Output Fields *(continued)*

Field Name	Field Description
Adjusting application	Name of the application that communicates shaping-rate adjustment information to the Junos OS class-of-service process (**cosd**) on the broadband services router (BSR). The BSR uses the information from this application to perform shaping-rate adjustments on the scheduler node that manages the interface set. The adjusting application appears as **ancp LS-0** which is the Junos OS Access Node Control Profile process (**ancpd**) that performs shaping-rate adjustments on schedule nodes. The nodes are logical interface sets configured to represent subscriber local loops. When the synchronization speed of the DSL line changes, **ancpd** communicates the local loop speed to **cosd** over the default logical system, **LS-0**, and then the BSR throttles the shaping rate on the scheduler node to the loop speed. The adjusting application can also appear as **PPPoE**, which adjusts the shaping-rate and overhead-accounting class-of-service attributes on dynamic subscriber interfaces in a broadband access network based on access line parameters in Point-to-Point Protocol over Ethernet (PPPoE) Tags [TR-101]. This feature is supported on MPC/MIC interfaces on MX Series routers. The shaping rate is based on the actual data rate downstream attribute. The overhead accounting value is based on the access loop encapsulation attribute and specifies whether the access loop uses Ethernet (frame mode) or ATM (cell mode).
Adjustment type	Type of shaping-rate adjustment performed by the BSR on the scheduler node. The type of adjustment appears as **absolute**, meaning that the configured shaping rate is adjusted by an absolute value as opposed to by a percentage of the configured rate.
Configured shaping rate	The maximum transmission rate on the physical interface as configured by the output traffic-control profile attached to the scheduler node.
Adjustment value	Value of the shaping-rate adjustment information sent by the adjusting application to **cosd**.
Adjustment overhead-accounting mode	Configured shaping mode: **frame** or **cell**.

Sample Output

show class-of-service interface-set

```
user@host> show class-of-service interface-set example-ifset-ge-4/0/0-7
Interface-set: example-ifset-ge-4/0/0-7, Index: 8
Physical interface: ge-4/0/0, Index: 270
Queues supported: 8, Queues in use: 8
  Output traffic control profile: example-tcp-basic-rate, Index: 11395
Adjusting application: ancp LS-0
  Adjustment type: absolute
  Configured shaping rate: 50000000
  Adjustment value: 888000
  Adjustment overhead-accounting mode: cell
```


show oam ethernet connectivity-fault-management interfaces

Syntax

show oam ethernet connectivity-fault-management interfaces
<*ethernet-interface-name*>
<level *md-level*>
<brief | detail | extensive>

Release Information

Command introduced in Junos OS Release 8.4.
Support for ITU-T Y.1731 frame delay measurement added in Junos OS Release 9.5.

Description

On M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M320, MX Series, ACX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for Ethernet interfaces.

In addition, for Ethernet interfaces on MX Series routers , also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts when **detail** or **extensive** mode is specified.

Options

brief | detail | extensive—(Optional) Specified level of output.

ethernet-interface-name—(Optional) CFM information only for CFM entities attached to the specified Ethernet interface.

level *md-level*—(Optional) CFM information for CFM identities enclosed within a maintenance domain of the specified level.

Required Privilege Level

view

Related Documentation

- clear oam ethernet connectivity-fault-management statistics
- show oam ethernet connectivity-fault-management delay-statistics
- show oam ethernet connectivity-fault-management mep-database on page 302
- show oam ethernet connectivity-fault-management mep-statistics

List of Sample Output

show oam ethernet connectivity-fault-management interfaces on page 297
show oam ethernet connectivity-fault-management interfaces detail on page 297
show oam ethernet connectivity-fault-management interfaces detail (One-Way ETH-DM) on page 298
show oam ethernet connectivity-fault-management interfaces detail(Connection Protection TLV Configured) on page 298
show oam ethernet connectivity-fault-management interfacesextensive on page 300
show oam ethernet connectivity-fault-management interfaces level on page 300
show oam ethernet connectivity-fault-management interfaces (trunk ports) on page 300

Output Fields

Table 25 on page 293 lists the output fields for the **show oam ethernet connectivity-fault-management interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 25: show oam ethernet connectivity-fault-management interfaces Output Fields

Field Name	Field Description	Level of Output
Interface	Interface identifier.	All levels
Interface status	Local interface status.	All levels
Link status	Local link status. **Up**, **down**, or **oam-down**.	All levels
Maintenance domain name	Maintenance domain name.	**detail extensive**
Format (Maintenance domain)	Maintenance domain name format configured.	**detail extensive**
Level	Maintenance domain level configured.	All levels
Maintenance association name	Maintenance association name.	**detail extensive**
Format (Maintenance association)	Maintenance association name format configured.	**detail extensive**
Continuity-check status	Continuity-check status.	**detail extensive**
Interval	Continuity-check message interval.	**detail extensive**
Loss-threshold	Lost continuity-check message threshold.	**detail extensive**
Interface status TLV	Status of the interface status TLV, if configured on the MEP interface: **none**, **up**, **down**, **testing**, **unknown**, **dormant**, **notPresent**, **lowerLayerDown**	**detail extensive**
Port status TLV	Status of the port status TLV, if configured on the MEP interface: **none**, **no**, **yes**	**detail extensive**
Connection Protection TLV	Status of the connection protection TLV if configured on the MEP interface: **no**, **yes** If **yes**, then the transmitted connection protection TLV is decoded and the following three fields are displayed: **Prefer me**, **Protection in use**, **FRR Flag**	**detail extensive**
Prefer me	If set to **yes**, the path through which CCM was transmitted is preferred (unless the path fails). It is used for signaling a manual-switch command to the remote side. Its value can be **yes** or **no**.	**detail extensive**
Protection in use	Used for protection decision coordination. Its value is set to **yes** if the endpoint transmitting the CCM is currently transmitting the user traffic to protection path. Its value can be **yes** or **no**.	**detail extensive**

Table 25: show oam ethernet connectivity-fault-management interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
FRR Flag	LSR/LER forwarding the CCM Frame into a bypass tunnel is set. Its value can be **yes** or **no**.	**detail extensive**
MEP identifier	Maintenance association end point (MEP) identifier.	All levels
Neighbors	Number of MEP neighbors.	All levels
Direction	MEP direction configured.	**detail extensive**
MAC address	MAC address configured for the MEP.	**detail extensive**
MEP status	Indicates the status of the connectivity fault management (CFM) protocol running on the MEP: **Running**, **inactive**, **disabled**, or **unsupported**.	**detail extensive**
Remote MEP not receiving CCM	Whether the remote MEP is not receiving connectivity check messages (CCMs).	**detail extensive**
Erroneous CCM received	Whether erroneous CCMs have been received.	**detail extensive**
Cross-connect CCM received	Whether cross-connect CCMs have been received.	**detail extensive**
RDI sent by some MEP	Whether the remote defect indication (RDI) bit is set in messages that have been received. The absence of the RDI bit in a CCM indicates that the transmitting MEP is receiving CCMs from all configured MEPs.	**detail extensive**
CCMs sent	Number of CCMs transmitted.	**detail extensive**
CCMs received out of sequence	Number of CCMs received out of sequence.	**detail extensive**
LBMs sent	Number of loopback request messages (LBMs) sent.	**detail extensive**
Valid in-order LBRs received	Number of loopback response messages (LBRs) received that were valid messages and in sequence.	**detail extensive**
Valid out-of-order LBRs received	Number of LBRs received that were valid messages and not in sequence.	**detail extensive**
LBRs received with corrupted data	Number of LBRs received that were corrupted.	**detail extensive**
LBRs sent	Number of LBRs transmitted.	**detail extensive**
LTMs sent	Linktrace messages (LTMs) transmitted.	**detail extensive**

Table 25: show oam ethernet connectivity-fault-management interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
LTMs received	Linktrace messages received.	**detail extensive**
LTRs sent	Linktrace responses (LTRs) transmitted.	**detail extensive**
LTRs received	Linktrace responses received.	**detail extensive**
Sequence number of next LTM request	Sequence number of next LTM request to be transmitted.	**detail extensive**
1DMs sent	If the interface is attached to an initiator MEP for a one-way ETH-DM session: Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session. For all other cases, this field displays **0**.	**detail extensive**
Valid 1DMs received	If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of valid 1DM frames received. For all other cases, this field displays **0**.	**detail extensive**
Invalid 1DMs received	If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of invalid 1DM frames received. For all other cases, this field displays **0**.	**detail extensive**
Out of sync 1DMs received	If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of out-of-sync one-way delay measurement request packets received.	**detail extensive**
DMMs sent	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of Delay Measurement Message (DMM) PDU frames sent to the peer MEP in this session. For all other cases, this field displays **0**.	**detail extensive**
Valid DMMs received	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of valid two-way delay measurement request packets received.	**detail extensive**
Invalid DMMs received	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of invalid two-way delay measurement request packets received.	**detail extensive**
DMRs sent	If the interface is attached to a responder MEP for a two-way ETH-DM session: Number of delay measurement reply (DMR) frames sent. For all other cases, this field displays **0**.	**detail extensive**
Valid DMRs received	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of valid DMRs received. For all other cases, this field displays **0**.	**detail extensive**

Table 25: show oam ethernet connectivity-fault-management interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Invalid DMRs received	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of invalid DMRs received. For all other cases, this field displays **0**.	**detail extensive**
LMM sent	If the interface is attached to an initiator MEP for a ETH-LM session: Number of loss measurement message (LMM) PDU frames sent to the peer MEP in this session.	**detail extensive**
Valid LMM received	If the interface is attached to an initiator MEP for a ETH-LM session: Number of valid loss measurement request packets received.	**detail extensive**
Invalid LMM received	If the interface is attached to an initiator MEP for a ETH-LM session: Number of invalid loss measurement request packets received.	**detail extensive**
LMR sent	If the interface is attached to a responder MEP for a ETH-LM session: Number of loss measurement reply (LMR) frames sent.	**detail extensive**
Valid LMR received	If the interface is attached to an initiator MEP for a ETH-LM session: Number of valid LMR frames received.	**detail extensive**
Invalid LMR received	If the interface is attached to an initiator MEP for a ETH-LM session: Number of invalid LMR frames received.	**detail extensive**
Remote MEP count	Number of remote MEPs.	**extensive**
Identifier (remote MEP)	MEP identifier of the remote MEP.	**extensive**
MAC address (remote MEP)	MAC address of the remote MEP.	**extensive**
State (remote MEP)	State of the remote MEP.	**extensive**
Interface (remote MEP)	Interface of the remote MEP.	**extensive**

Sample Output

show oam ethernet connectivity-fault-management interfaces

```
user@host> show oam ethernet connectivity-fault-management interfaces
Interface         Link       Status            Level        MEP           Neighbors
                                                            Identifier
ge-1/1/0.0        Up         Active            0            2             1
ge-1/1/0.1        Up         Active            0            2             1
ge-1/1/0.10       Up         Active            0            2             1
ge-1/1/0.100      Up         Active            0            2             1
ge-1/1/0.101      Up         Active            0            2             1
ge-1/1/0.102      Up         Active            0            2             1
ge-1/1/0.103      Up         Active            0            2             1
ge-1/1/0.104      Up         Active            0            2             1
ge-1/1/0.105      Up         Active            0            2             1
ge-1/1/0.106      Up         Active            0            2             1

...
```

show oam ethernet connectivity-fault-management interfaces detail

```
user@host> show oam ethernet connectivity-fault-management interfaces detail
Interface name: ge-5/2/9.0, Interface status: Active, Link status: Up
  Maintenance domain name: md0, Format: string, Level: 5
  Maintenance association name: ma1, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
   MEP identifier: 1, Direction: down, MAC address: 00:90:69:0b:4b:94
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                      : no
      Erroneous CCM received                            : yes
      Cross-connect CCM received                        : no
      RDI sent by some MEP                              : yes
    Statistics:
      CCMs sent                                         : 76
      CCMs received out of sequence                     : 0
      LBMs sent                                         : 0
      Valid in-order LBRs received                      : 0
      Valid out-of-order LBRs received                  : 0
      LBRs received with corrupted data                 : 0
      LBRs sent                                         : 0
      LTMs sent                                         : 0
      LTMs received                                     : 0
      LTRs sent                                         : 0
      LTRs received                                     : 0
      Sequence number of next LTM request               : 0
      1DMs sent                                         : 0
      Valid 1DMs received                               : 0
      Invalid 1DMs received                             : 0
      DMMs sent                                         : 0
      DMRs sent                                         : 0
      Valid DMRs received                               : 0
      Invalid DMRs received                             : 0
      LMM sent                                          : 10
      Valid LMM received                                : 20
      Invalid LMM received                              : 0
      LMR sent                                          : 20
      Valid LMR received                                : 10
      Invalid LMR received                              : 0
    Remote MEP count: 2
      Identifier     MAC address          State    Interface
       2001      00:90:69:0b:7f:71        ok     ge-5/2/9.0
```



```
          4001      00:90:69:0b:09:c5       ok     ge-5/2/9.0
```

show oam ethernet connectivity-fault-management interfaces detail (One-Way ETH-DM)

user@host **show oam ethernet connectivity-fault-management interfaces detail**

```
Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
  Maintenance domain name: md6, Format: string, Level: 6
    Maintenance association name: ma6, Format: string
    Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
     MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                       : no
      Erroneous CCM received                             : no
      Cross-connect CCM received                         : no
      RDI sent by some MEP                               : no
    Statistics:
      CCMs sent                                          : 1590
      CCMs received out of sequence                      : 0
      LBMs sent                                          : 0
      Valid in-order LBRs received                       : 0
      Valid out-of-order LBRs received                   : 0
      LBRs received with corrupted data                  : 0
      LBRs sent                                          : 0
      LTMs sent                                          : 0
      LTMs received                                      : 0
      LTRs sent                                          : 0
      LTRs received                                      : 0
      Sequence number of next LTM request                : 0
      1DMs sent                                          : 10
      Valid 1DMs received                                : 0
      Invalid 1DMs received                              : 0
      DMMs sent                                          : 0
      DMRs sent                                          : 0
      Valid DMRs received                                : 0
      Invalid DMRs received                              : 0
    Remote MEP count: 1
      Identifier     MAC address        State    Interface
        201      00:90:69:0a:43:94       ok     ge-0/2/5.0
```

show oam ethernet connectivity-fault-management interfaces detail (Connection Protection TLV Configured)

user@host**show oam ethernet connectivity-fault-management interfaces detail**

```
Interface name: xe-6/2/0.0 , Interface status: Active, Link status: Up
  Maintenance domain name: md6, Format: string, Level: 6
 Maintenance association name: ma6, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    Connection Protection TLV: yes
      Prefer me: no, Protection in use: no, FRR Flag: no
    MEP identifier: 1, Direction: down, MAC address: 00:19:e2:b1:14:30
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                       : no
      Erroneous CCM received                             : no
      Cross-connect CCM received                         : no
      RDI sent by some MEP                               : no
      Some remote MEP's MAC in error state               : no
    Statistics:
      CCMs sent                                          : 225
      CCMs received out of sequence                      : 0
      LBMs sent                                          : 0
      Valid in-order LBRs received                       : 0
```

```
  Valid out-of-order LBRs received              : 0
  LBRs received with corrupted data             : 0
  LBRs sent                                     : 0
  LTMs sent                                     : 0
  LTMs received                                 : 0
  LTRs sent                                     : 0
  LTRs received                                 : 0
  Sequence number of next LTM request           : 0
  1DMs sent                                     : 0
  Valid 1DMs received                           : 0
  Invalid 1DMs received                         : 0
  Out of sync 1DMs received                     : 0
  DMMs sent                                     : 0
  Valid DMMs received                           : 0
  Invalid DMMs received                         : 0
  DMRs sent                                     : 0
  Valid DMRs received                           : 0
  Invalid DMRs received                         : 0
  LMMs sent                                     : 0
  Valid LMMs received                           : 0
  Invalid LMMs received                         : 0
  LMRs sent                                     : 0
  Valid LMRs received                           : 0
  Invalid LMRs received                         : 0
Remote MEP count: 1
  Identifier    MAC address        State    Interface
      2     00:90:69:7f:e4:30
```


show oam ethernet connectivity-fault-management interfaces extensive

```
user@host> show oam ethernet connectivity-fault-management interfaces extensive
Interface name: ge-5/2/9.0, Interface status: Active, Link status: Up
  Maintenance domain name: md0, Format: string, Level: 5
    Maintenance association name: ma1, Format: string
    Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    Connection Protection TLV: no
 MEP identifier: 1, Direction: down, MAC address: 00:90:69:0b:4b:94
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                : no
      Erroneous CCM received                      : yes
      Cross-connect CCM received                  : no
      RDI sent by some MEP                        : yes
    Statistics:
      CCMs sent                                   : 76
      CCMs received out of sequence               : 0
      LBMs sent                                   : 0
      Valid in-order LBRs received                : 0
      Valid out-of-order LBRs received            : 0
      LBRs received with corrupted data           : 0
      LBRs sent                                   : 0
      LTMs sent                                   : 0
      LTMs received                               : 0
      LTRs sent                                   : 0
      LTRs received                               : 0
      Sequence number of next LTM request         : 0
      1DMs sent                                   : 0
      Valid 1DMs received                         : 0
      Invalid 1DMs received                       : 0
      DMMs sent                                   : 0
      DMRs sent                                   : 0
      Valid DMRs received                         : 0
      Invalid DMRs received                       : 0
    Remote MEP count: 2
      Identifier     MAC address        State    Interface
       2001      00:90:69:0b:7f:71       ok    ge-5/2/9.0
       4001      00:90:69:0b:09:c5       ok    ge-5/2/9.0
```

show oam ethernet connectivity-fault-management interfaces level

```
user@host> show oam ethernet connectivity-fault-management interfaces level 7
Interface        Link        Status           Level       MEP          Neighbors
                                                          Identifier
ge-3/0/0.0       Up          Active             7         201          0
xe-0/0/0.0       Up          Active             7         203          1
```

show oam ethernet connectivity-fault-management interfaces (trunk ports)

```
user@host> show oam ethernet connectivity-fault-management interfaces

Interface                    Link      Status       Level  MEP         Neighbors
                                                           Identifier
ge-4/0/1.0, vlan 100         Up        Active       5      100         0
ge-10/3/10.4091, vlan 4091   Down      Inactive     4      400         0
ge-4/0/0.0                   Up        Active       6      200         0
```

```
user@host> show oam ethernet connectivity-fault-management interfaces ge-4/0/0.0

Interface                    Link      Status       Level  MEP         Neighbors
                                                           Identifier
```

```
ge-4/0/0.0                 Up        Active       6      200         0
```

`user@host>` **show oam ethernet connectivity-fault-management interfaces ge-4/0/1.0 vlan 100**

```
Interface                  Link      Status       Level  MEP         Neighbors
                                                         Identifier
ge-4/0/1.0, vlan 100       Up        Active       5      100         0
```

`user@host>` **show oam ethernet connectivity-fault-management interfaces ge-10/3/10.4091 vlan 4091**

```
Interface                  Link      Status       Level  MEP         Neighbors
                                                         Identifier
ge-10/3/10.4091, vlan 4091 Down      Inactive     4      400         0
```

show oam ethernet connectivity-fault-management mep-database

Syntax

show oam ethernet connectivity-fault-management mep-database
maintenance-domain *domain-name*
maintenance-association *ma-name*
<local-mep *local-mep-id*>
<remote-mep *remote-mep-id*>

Release Information

Command introduced in Junos OS Release 8.4.
Support for ITU-T Y.1731 frame delay measurement added in Junos OS Release 9.5.

Description

On M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M320, M120, MX Series, ACX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for CFM maintenance association end points (MEPs) in a CFM session.

In addition, on M120, M320, and MX series routers, also display port status TLV, interface status TLV, and action profile information.

In addition, for Ethernet interfaces on MX Series routers , also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts.

Options

maintenance-association *ma-name*—Name of the maintenance association.

maintenance-domain *domain-name*—Name of the maintenance domain.

local-mep-id—(Optional) Numeric identifier of local MEP.

remote-mep-id—(Optional) Numeric identifier of the remote MEP.

Required Privilege Level

view

Related Documentation

- clear oam ethernet connectivity-fault-management statistics
- show oam ethernet connectivity-fault-management delay-statistics
- show oam ethernet connectivity-fault-management interfaces on page 292
- show oam ethernet connectivity-fault-management mep-statistics

List of Sample Output

show oam ethernet connectivity-fault-management mep-database on page 308
show oam ethernet connectivity-fault-management mep-database (One-Way ETH-DM) on page 308
show oam ethernet connectivity-fault-management mep-database local-mep remote-mep on page 309
show oam ethernet connectivity-fault-management mep-database remote-mep (Action Profile Event) on page 309
show oam ethernet connectivity-fault-management mep-database (Connection Protection TLV Configured) on page 309
show oam ethernet connectivity-fault-management mep-database on page 310

show oam ethernet connectivity-fault-management mep-database (enhanced continuity measurement) on page 311

Output Fields Table 26 on page 303 lists the output fields for the **show oam ethernet connectivity-fault-management mep-database** command. Output fields are listed in the approximate order in which they appear.

Table 26: show oam ethernet connectivity-fault-management mep-database Output Fields

Field Name	Field Description
Maintenance domain name	Maintenance domain name.
Format (Maintenance domain)	Maintenance domain name format configured.
Level	Maintenance domain level configured.
Maintenance association name	Maintenance association name.
Format (Maintenance association)	Maintenance association name format configured.
Continuity-check status	Continuity-check status.
Interval	Continuity-check message interval.
Loss-threshold	Lost continuity-check message threshold.
Connection Protection TLV	Status of the connection protection TLV, if configured on the MEP interface: **no**, **yes** If **yes**, then the transmitted connection protection TLV is decoded and the following three fields are displayed: **Prefer me**, **Protection in use**, **FRR Flag**
Prefer me	If set to **yes**, the path through which CCM was transmitted is preferred (unless the path fails). It is used for signaling a manual-switch command to remote side. Its value can be **yes** or **no**.
Protection in use	Used for protection decision coordination. Its value is set to **yes** if the endpoint transmitting the CCM is currently transmitting the user traffic to protection path. Its value can be **yes** or **no**.
FRR Flag	LSR/LER forwarding the CCM Frame into a bypass tunnel is set. Its value can be **yes** or **no**.
MEP identifier	Maintenance association end point (MEP) identifier.
Direction	MEP direction configured.

Table 26: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

Field Name	Field Description
MAC address	MAC address configured for the MEP.
Auto-discovery	Whether automatic discovery is enabled or disabled.
Priority	Priority used for CCMs and linktrace messages transmitted by the MEP.
Interface name	Interface identifier.
Interface status	Local interface status.
Link status	Local link status.
Remote MEP not receiving CCM	Whether the remote MEP is not receiving CCMs.
Erroneous CCM received	Whether erroneous CCMs have been received.
Cross-connect CCM received	Whether cross-connect CCMs have been received.
RDI sent by some MEP	Whether the remote defect indication (RDI) bit is set in messages that have been received. The absence of the RDI bit in a CCM indicates that the transmitting MEP is receiving CCMs from all configured MEPs.
CCMs sent	Number of CCMs transmitted.
CCMs received out of sequence	Number of CCMs received out of sequence.
LBMs sent	Number of loopback messages (LBMs) sent.
Valid in-order LBRs received	Number of loopback response messages (LBRs) received that were valid messages and in sequence.
1DMs sent	If the MEP is an initiator for a one-way ETH-DM session: Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session. For all other cases, this field displays **0**.
Valid 1DMs received	If the MEP is a receiver for a one-way ETH-DM session: Number of valid 1DM frames received. For all other cases, this field displays **0**.
Invalid 1DMs received	If the MEP is a receiver for a one-way ETH-DM session: Number of invalid 1DM frames received. For all other cases, this field displays **0**.

Table 26: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

Field Name	Field Description
Out of sync 1DMs received	If the MEP is a receiver for a one-way ETH-DM session: Number of out-of-sync one-way delay measurement request packets received.
DMMs sent	If the MEP is an initiator for a two-way ETH-DM session: Number of Delay Measurement Message (DMM) PDU frames sent to the peer MEP in this session. For all other cases, this field displays **0**.
Valid DMMs received	If the MEP is an initiator for a two-way ETH-DM session: Number of valid two-way delay measurement packets received.
Invalid DMMs received	If the MEP is an initiator for a two-way ETH-DM session: Number of invalid two-way delay measurement packets received.
DMRs sent	If the MEP is a responder for a ETH-DM session: Number of Delay Measurement Reply (DMR) frames sent. For all other cases, this field displays **0**.
Valid DMRs received	If the MEP is an initiator for a two-way ETH-DM session: Number of valid DMRs received. For all other cases, this field displays **0**.
Invalid DMRs received	If the MEP is an initiator for a two-way ETH-DM session: Number of invalid DMRs received. For all other cases, this field displays **0**.
Valid out-of-order LBRs received	Number of LBRs received that were valid messages and not in sequence.
LBRs received with corrupted data	Number of LBRs received that were corrupted.
LBRs sent	Number of LBRs transmitted.
LTMs sent	Linktrace messages (LTMs) transmitted.
LTMs received	Linktrace messages received.
LTRs sent	Linktrace responses (LTRs) transmitted.
LTRs received	Linktrace responses received.
Sequence number of next LTM request	Sequence number of the next linktrace message request to be transmitted.
LMM sent	If the interface is attached to an initiator MEP for a ETH-LM session: Number of loss measurement message (LMM) PDU frames sent to the peer MEP in this session.

Table 26: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

Field Name	Field Description
Valid LMM received	If the interface is attached to an initiator MEP for a ETH-LM session: Number of valid loss measurement request packets received.
Invalid LMM received	If the interface is attached to an initiator MEP for a ETH LM session: Number of invalid loss measurement request packets received.
LMR sent	If the interface is attached to a responder MEP for a ETH-LM session: Number of loss measurement reply (LMR) frames sent.
Valid LMR received	If the interface is attached to an initiator MEP for a ETH LM session: Number of valid LMR frames received.
Invalid LMR received	If the interface is attached to an initiator MEP for a ETH-LM session: Number of invalid LMR frames received.
Remote MEP identifier	MEP identifier of the remote MEP.
State (remote MEP)	State of the remote MEP: **idle**, **start**, **ok**, or **failed**.
MAC address	MAC address of the remote MEP.
Type	Whether the remote MEP MAC address was learned using automatic discovery or configured.
Interface	Interface of the remote MEP. A seven-digit number is appended if CFM is configured to run on a routing instance of type VPLS.
Last flapped	Date, time, and how long ago the remote MEP interface went from down to up. The format is **Last flapped:** ***year-month-day hours*:*minutes*:*seconds timezone*** **(*hours*:*minutes*:*seconds* ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)**.
Remote defect indication	Whether the remote defect indication (RDI) bit is set in messages that have been received or transmitted.
Port status TLV	• In the Maintenance domain section, displays the last transmitted port status TLV value. • In the Remote MEP section, displays the last value of port status TLV received from the remote MEP. In the Action profile section, displays, the last occurred event **port-status-tlv blocked** event. This event occurred due to the reception of **blocked** value in the port status TLV from remote MEP.
Interface status TLV	• In the Maintenance domain section, displays the last transmitted interface status TLV value. • In the Remote MEP section, displays the last value of interface status TLV received from the remote MEP. In the Action profile section, if displays, the last occurred event interface-status-tlv event (either **lower-layer-down** or **down**). This event occurred due to the reception of either lower or **down** value in the interface status TLV from remote MEP.
Action profile	Name of the action profile occurrence associated with a remote MEP.

Table 26: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

Field Name	Field Description
Last event	When an action profile occurs, displays the last event that triggered it.
Last event cleared	When all the configured and occurred events (under action profile) are cleared, then the action taken gets reverted (such as down interface is made up) and the corresponding time is noted and displayed.
Action	Action taken and the corresponding time of the action occurrence.

Sample Output

show oam ethernet connectivity-fault-management mep-database

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain vpls-vlan2000 maintenance-association vpls-vlan200
Maintenance domain name: vpls-vlan2000, Format: string, Level: 5
  Maintenance association name: vpls-vlan200, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
  MEP identifier: 200, Direction: up, MAC address: 00:19:e2:b0:74:01
  Auto-discovery: enabled, Priority: 0
 Interface status TLV: none, Port status TLV: none
  Connection Protection TLV: no  Interface name: ge-0/0/1.0, Interface status:
Active, Link status: Up
  Defects:
    Remote MEP not receiving CCM                   : no
    Erroneous CCM received                         : no
    Cross-connect CCM received                     : no
    RDI sent by some MEP                           : no
  Statistics:
    CCMs sent                                      : 1476
    CCMs received out of sequence                  : 0
    LBMs sent                                      : 85
    Valid in-order LBRs received                   : 78
    Valid out-of-order LBRs received               : 0
    LBRs received with corrupted data              : 0
    LBRs sent                                      : 0
    LTMs sent                                      : 1
    LTMs received                                  : 0
    LTRs sent                                      : 0
    LTRs received                                  : 1
    Sequence number of next LTM request            : 1
    1DMs sent                                      : 0
    Valid 1DMs received                            : 0
    Invalid 1DMs received                          : 0
    DMMs sent                                      : 0
    DMRs sent                                      : 0
    Valid DMRs received                            : 0
    Invalid DMRs received                          : 0
  Remote MEP count: 1
    Identifier     MAC address        State    Interface
      100     00:19:e2:b2:81:4b       ok  vt-0/1/10.1049088
```

show oam ethernet connectivity-fault-management mep-database (One-Way ETH-DM)

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain md6 maintenance-domain ma6
Maintenance domain name: md6, Format: string, Level: 6
  Maintenance association name: ma6, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
  MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
  Auto-discovery: enabled, Priority: 0
  Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
  Defects:
    Remote MEP not receiving CCM                   : no
    Erroneous CCM received                         : no
    Cross-connect CCM received                     : no
    RDI sent by some MEP                           : no
  Statistics:
    CCMs sent                                      : 1590
    CCMs received out of sequence                  : 0
    LBMs sent                                      : 0
    Valid in-order LBRs received                   : 0
```

```
    Valid out-of-order LBRs received              : 0
    LBRs received with corrupted data             : 0
    LBRs sent                                     : 0
    LTMs sent                                     : 0
    LTMs received                                 : 0
    LTRs sent                                     : 0
    LTRs received                                 : 0
    Sequence number of next LTM request           : 0
    1DMs sent                                     : 10
    Valid 1DMs received                           : 0
    Invalid 1DMs received                         : 0
    DMMs sent                                     : 0
    DMRs sent                                     : 0
    Valid DMRs received                           : 0
    Invalid DMRs received                         : 0
  Remote MEP count: 1
    Identifier    MAC address        State    Interface
      201     00:90:69:0a:43:94       ok    ge-0/2/5.0
```

show oam ethernet connectivity-fault-management mep-database local-mep remote-mep

`user@host>` **show oam ethernet connectivity-fault-management mep-database maintenance-domain vpls-vlan2000 maintenance-association vpls-vlan200 local-mep 200 remote-mep 100**

```
Maintenance domain name: vpls-vlan2000, Format: string, Level: 5
  Maintenance association name: vpls-vlan200, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
  MEP identifier: 200, Direction: up, MAC address: 00:19:e2:b0:74:01
  Auto-discovery: enabled, Priority: 0
  Interface name: ge-0/0/1.0, Interface status: Active, Link status: Up

  Remote MEP identifier: 100, State: ok
    MAC address: 00:19:e2:b2:81:4b, Type: Learned
    Interface: vt-0/1/10.1049088
    Last flapped: Never
    Remote defect indication: false
    Port status TLV: none
    Interface status TLV: none
```

show oam ethernet connectivity-fault-management mep-database remote-mep (Action Profile Event)

`user@host>` **show oam ethernet connectivity-fault-management mep-database maintenance-domain md5 maintenance-association ma5 remote-mep 200**

```
Maintenance domain name: md5, Format: string, Level: 5
  Maintenance association name: ma5, Format: string
  Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
  MEP identifier: 100, Direction: down, MAC address: 00:05:85:73:e8:ad
  Auto-discovery: enabled, Priority: 0
  Interface status TLV: none, Port status TLV: none
  Interface name: ge-1/0/8.0, Interface status: Active, Link status: Up

  Remote MEP identifier: 200, State: ok
    MAC address: 00:05:85:73:96:1f, Type: Configured
    Interface: ge-1/0/8.0
    Last flapped: Never
    Remote defect indication: false
    Port status TLV: none
    Interface status TLV: lower-layer-down
    Action profile: juniper
      Last event: Interface-status-tlv lower-layer-down
      Action: Interface-down, Time: 2009-03-27 14:25:10 PDT (00:00:02 ago)
```

`user@host>`**show oam ethernet connectivity-fault-management mep-database** show oam ethernet connectivity-fault-management mep-database (Connection Protection TLV Configured)

maintenance-domain md5 maintenance-association ma5

If connection-protection is not enabled on down MEPs, but connection-protection TLV is used, MX always sets the protection-in-use flag in connection-protection tlv, while CCMs are sent out. During reversion, this is an indicator to the receiver that protect-path is in use, otherwise the peer (receiver) assumes working is active and reversion does not work as expected. Setting this bit does not affect protection-switching/traffic-loss.

```
Maintenance domain name: md5, Format: string, Level: 5
  Maintenance association name: ma5, Format: string
  Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
  MEP identifier: 1, Direction: down, MAC address: 00:19:e2:b1:14:30
  Auto-discovery: enabled, Priority: 0
  Interface status TLV: none, Port status TLV: none
  Connection Protection TLV: yes
    Prefer me: no, Protection in use: no, FRR Flag: no
  Interface name: xe-6/2/0.0, Interface status: Active, Link status: Up
  Defects:
    Remote MEP not receiving CCM                  : no
    Erroneous CCM received                        : no
    Cross-connect CCM received                    : no
    RDI sent by some MEP                          : no
    Some remote MEP's MAC in error state          : no
  Statistics:
    CCMs sent                                     : 251
    CCMs received out of sequence                 : 0
    LBMs sent                                     : 0
    Valid in-order LBRs received                  : 0
    Valid out-of-order LBRs received              : 0
    LBRs received with corrupted data             : 0
    LBRs sent                                     : 0
    LTMs sent                                     : 0
    LTMs received                                 : 0
    LTRs sent                                     : 0
    LTRs received                                 : 0
    Sequence number of next LTM request           : 0
    1DMs sent                                     : 0
    Valid 1DMs received                           : 0
    Invalid 1DMs received                         : 0
    Out of sync 1DMs received                     : 0
    DMMs sent                                     : 0
    Valid DMMs received                           : 0
    Invalid DMMs received                         : 0
    DMRs sent                                     : 0
    Valid DMRs received                           : 0
    Invalid DMRs received                         : 0
    LMMs sent                                     : 0
    Valid LMMs received                           : 0
    Invalid LMMs received                         : 0
    LMRs sent                                     : 0
    Valid LMRs received                           : 0
    Invalid LMRs received                         : 0
  Remote MEP count: 1
   Identifier     MAC address         State    Interface
        2      00:90:69:7f:e4:30
```

show oam ethernet connectivity-fault-management mep-database

user@host> **show oam ethernet connectivity-fault-management mep-database maintenance-domain md5 maintenance-association ma5**

```
Maintenance association name: ma1, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
MEP identifier: 1, Direction: down, MAC address: 00:14:f6:b6:01:fe
```



```
Auto-discovery: enabled, Priority: 0
Interface name: ge-1/0/0.0, Interface status: Active, Link status: Up

Defects:
Remote MEP not receiving CCM         : no
Erroneous CCM received               : no
Cross-connect CCM received           : no
RDI sent by some MEP                 : no

Statistics:
CCMs sent                            : 328703
CCMs received out of sequence        : 0
LBMs sent                            : 85
Valid in-order LBRs received         : 78
Valid out-of-order LBRs received     : 0
LBRs received with corrupted data    : 0
LBRs sent                            : 0
LTMs sent                            : 0
LTMs received                        : 0
LTRs sent                            : 0
LTRs received                        : 0
Sequence number of next LTM request  : 0
1DMs sent                            : 10
Valid 1DMs received                  : 10
Invalid 1DMs received                : 0
DMMs sent                            : 20
DMRs sent                            : 0
Valid DMRs received                  : 10
Invalid DMRs received                : 0
LMM sent                             : 10
Valid LMM received                   : 20
Invalid LMM received                 : 0
LMR sent                             : 20
Valid LMR received                   : 10
Invalid LMR received                 : 0
Remote MEP count                     : 1

Identifier     MAC address         State     Interface
    2       00:12:1e:fb:ea:7d       ok        ge-1/0/0.0
```

show oam ethernet connectivity-fault-management mep-database (enhanced continuity measurement)

user@host> **show oam ethernet connectivity-fault-management mep-database maintenance-domain md5 maintenance-association ma5 local-mep 2001 remote-mep 1001**

```
Maintenance domain name: md5, Format: string, Level: 5
Maintenance association name: ma5, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 2001, Direction: down, MAC address: 00:19:e2:b2:81:4a
Auto-discovery: enabled, Priority: 0
Interface status TLV: up, Port status TLV: up
Interface name: ge-2/0/0.0, Interface status: Active, Link status: Up

Remote MEP identifier: 1001, State: ok
MAC address  : 00:19:e2:b0:74:00, Type: Learned
Interface    : ge-2/0/0.0
Last flapped  : Never
+ Continuity  : 91%, Admin-enable duration: 2100sec, Oper-down duration: 100sec
Remote defect indication: false
Port status TLV: none
Interface status TLV: none
```


show oam ethernet connectivity-fault-management mip

Syntax show oam ethernet connectivity-fault-management mip <*qualifier*>

Release Information Command introduced in Junos OS Release 9.4.

Description On the MX Series routers, display all the maintenance association intermediate points (MIPs) created in the system. Qualifiers also available to display specific MIPs.

Options This command has no options.

Required Privilege Level View

Output Fields Table 27 on page 312 lists the output fields for the **show oam ethernet connectivity-fault-management mip** command. Output fields are listed in the approximate order in which they appear.

Table 27: show oam ethernet connectivity-fault-management mip Output Fields

Field Name	Field Description
MIP information for instance	Header for the MIP information showing the MIP name.
Interface	Interface type-dpc/pic/port.unit-number.
Level	MIP level configured.

Sample Output

show oam ethernet connectivity-fault-management mip

```
user@host> show oam ethernet connectivity-fault-management mip
MIP information for instance __mip_name__

MIP information for instance default-switch bd1

  Interface       Level
  ge-3/0/0.0          7
  ge-3/0/1.0          6
  ge-3/0/3.0          6
MIP information for instance vpls-1

  Interface       Level
  ge-3/0/2.0          7
  ge-3/0/4.0          6
```


traceroute ethernet

Syntax

traceroute ethernet (*mac-address* | *mep-id*)
maintenance-association *ma-name*
maintenance-domain *md-name*
ttl *value*
<wait *seconds*>

Release Information

Command introduced in Junos OS Release 9.0.
mep-id option introduced in Junos OS Release 9.1.

Description

Triggers the linktrace protocol to trace the route between two maintenance points. The result of the traceroute protocol is stored in the path database. To display the path database, use the **show oam ethernet connectivity-fault-management path-database** command.

Before using the traceroute command, you can verify the remote MEP's MAC address using the **show oam ethernet connectivity-fault-management path-database** command.

Options

mac-address—Destination unicast MAC address of the remote maintenance point.

mep-id—MEP identifier of the remote maintenance point. The range of values is 1 through 8191.

maintenance-association *ma-name*—Specifies an existing maintenance association from the set of configured maintenance associations.

maintenance-domain *md-name*—Specifies an existing maintenance domain from the set of configured maintenance domains.

ttl *value*—Number of hops to use in the linktrace request. The range is 1 to 255 hops. The default is 4.

wait *seconds*—(Optional) Maximum time to wait for a response to the traceroute request. The range is 1 to 255 seconds. The default is 5.

Required Privilege Level

network

List of Sample Output

traceroute ethernet on page 314

Output Fields

Table 28 on page 313 lists the output fields for the **traceroute ethernet** command. Output fields are listed in the approximate order in which they appear.

Table 28: traceroute ethernet Output Fields

Field Name	Field Description
Linktrace to	MAC address of the destination maintenance point.
Interface	Local interface used to send the linktrace message (LTM).

Table 28: traceroute ethernet Output Fields *(continued)*

Field Name	Field Description
Maintenance Domain	Maintenance domain specified in the traceroute command.
Level	Maintenance domain level configured.
Maintenance Association	Maintenance association specified in the traceroute command.
Local Mep	The local maintenance end point identifier.
Transaction Identifier	4-byte identifier maintained by the MEP. Each LTM uses a transaction identifier. The transaction identifier is maintained globally across all Maintenance Domains. Use the transaction identifier to match an incoming linktrace response (LTR), with a previously sent LTM.
Hop	Sequential hop count of the linktrace path.
TTL	Number of hops remaining in the linktrace message. The time to live (TTL) is decremented at each hop.
Source MAC address	MAC address of the 802.1ag maintenance point that is sending the linktrace message.
Next-hop MAC address	MAC address of the 802.1ag node that is the next hop in the LTM path.

Sample Output

traceroute ethernet

user@host> **traceroute ethernet maintenance-domain md1 maintenance-association ma1 00:90:69:7e:01:ff**

```
Linktrace to 00:01:02:03:04:05, Interface : ge-5/0/0.0
       Maintenance Domain: MD1, Level: 7
       Maintenance Association: MA1, Local Mep: 1

       Hop      TTL      Source MAC address        Next hop MAC address
       Transaction Identifier:100001
       1        63       00:00:aa:aa:aa:aa         00:00:bb:bb:bb:bb
       2        62       00:00:bb:bb:bb:bb         00:00:cc:cc:cc:cc
       3        61       00:00:cc:cc:cc:cc         00:01:02:03:04:05
       4        60       00:01:02:03:04:05         00:00:00:00:00:00
```

PART 4

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