



Junos[®] OS

Provider Backbone Bridging on MX Series Routers

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PART 1

Overview

- [Provider Backbone Bridging Overview on page 3](#)
- [Class of Service Overview on page 9](#)
- [Connectivity Fault Management Overview on page 13](#)

CHAPTER 1

Provider Backbone Bridging Overview

- [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 5](#)
- [Understanding PIP and CBP Interfaces on MX Series Routers on page 6](#)

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.

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 5](#)
- [Understanding PIP and CBP Interfaces on MX Series Routers on page 6](#)
- [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

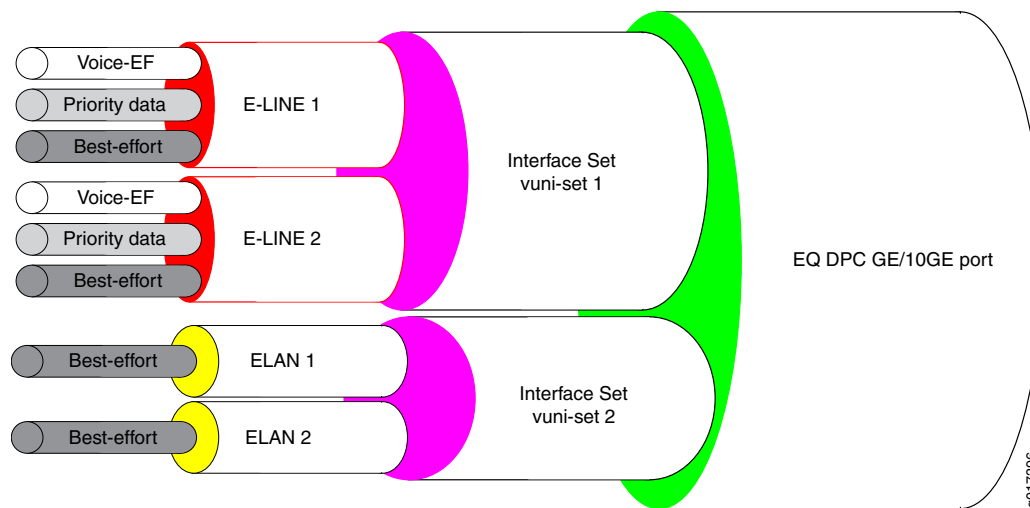
Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability in service provider networks. The Junos OS implementation of PBB supports the IEEE 802.1ah (PBB) standards including the provisioning of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

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 79](#)
- [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

- [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.

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 79](#)

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 10](#)
- [Forwarding Classes on page 11](#)
- [Drop Profiles on page 11](#)
- [Schedulers on page 11](#)
- [Rewrite Rules on page 11](#)

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 79](#)
 - [Understanding Class of Service and PBB for MX Series Routers on page 9](#)

CHAPTER 3

Connectivity Fault Management Overview

- 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.

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 103](#)
- [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 143](#)
- [Connectivity Fault Management Configuration Statements on page 171](#)
- [CoS Configuration Statements on page 191](#)
- [Interface Set Configuration Statements on page 217](#)

CHAPTER 4

Provider Backbone Bridging Solutions

- [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 79](#)
- [Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103](#)

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 38](#)
- [Configuring E-LINE and E-LAN Services on BEB4 \(Cubs\) on page 43](#)
- [Configuring Routing Instances and Interfaces on ES1 \(Pinot Noir\) on page 52](#)
- [Configuring a Routing Instance and Interfaces on ES3 \(Dolcetto\) on page 56](#)
- [Configuring a Routing Instance and Interfaces on ES4 \(Reds\) on page 58](#)
- [Configuring a Routing Instance and Interfaces on BCB1 \(Syrah\) on page 63](#)
- [Configuring a Routing Instance and Interfaces on BCB2 \(Cabernet\) on page 66](#)
- [Verification on page 70](#)

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

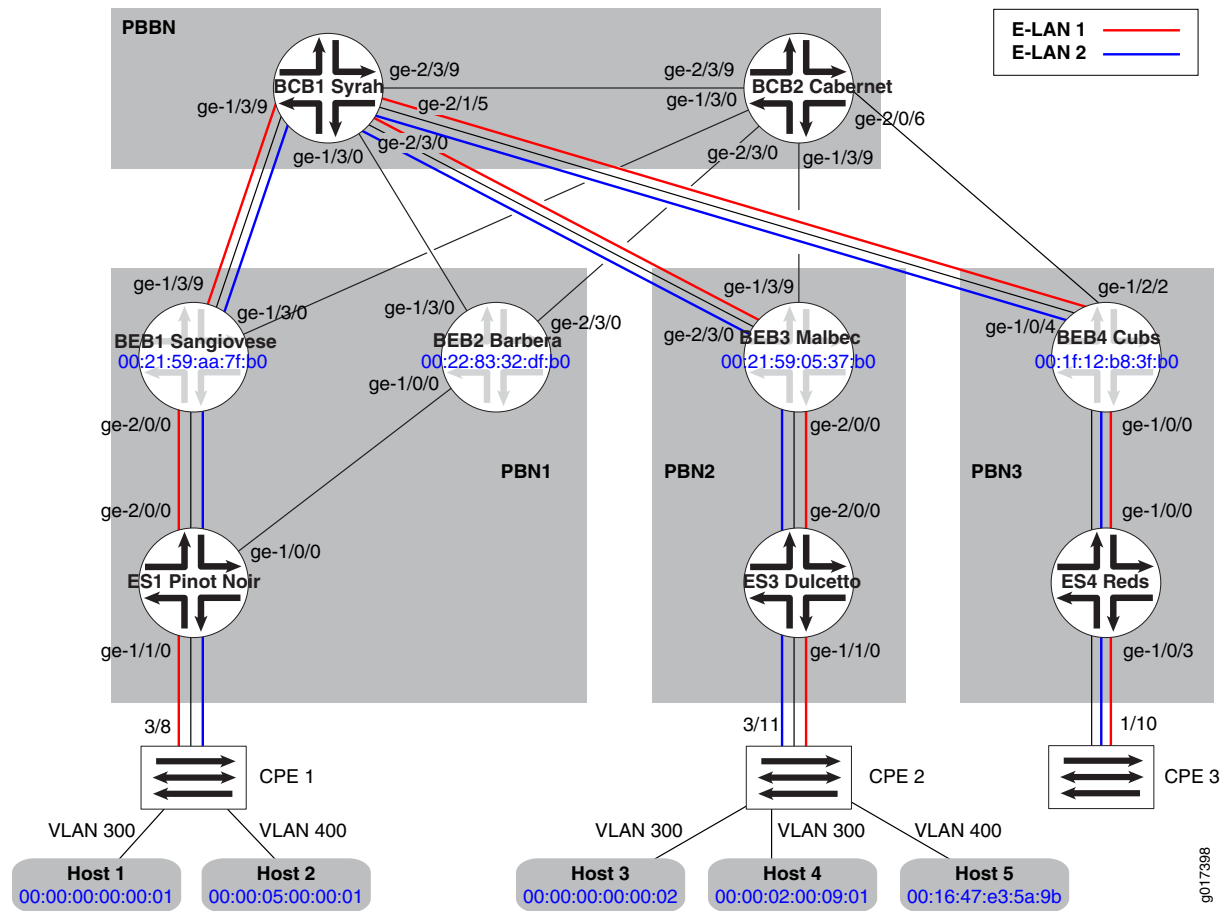


Figure 3 on page 20 displays the E-LINE service topology for this example. The two E-LINES are shown using the default path created through the MSTP configuration. The active paths shown in the topology are based on the MSTP configuration in the PBBN core network and the resulting paths resulting paths 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

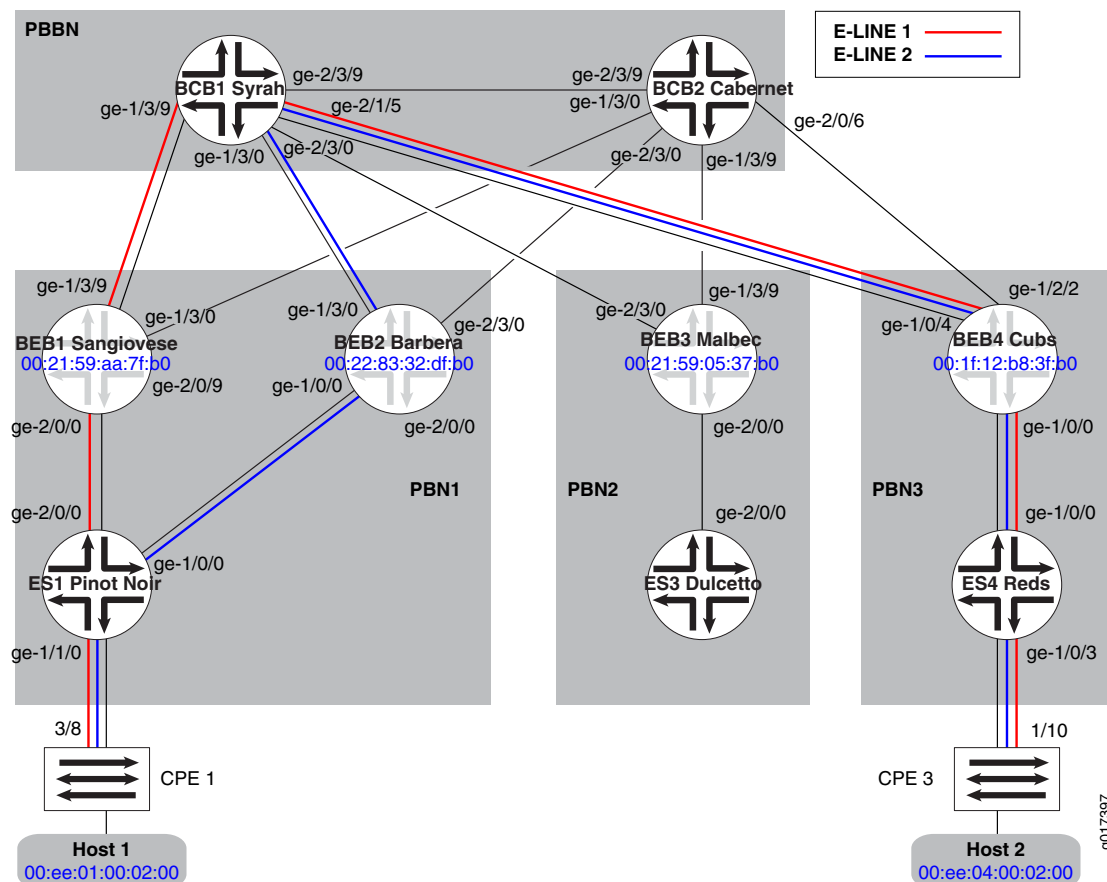


Table 1 on page 20 shows the different properties that will be configured for E-LINE and E-LAN services on the MX Series routers in the topology.

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: <ul style="list-style-type: none"> • BEB1 • BEB2 PBN2 contains: <ul style="list-style-type: none"> • BEB3 PBN3 contains: <ul style="list-style-type: none"> • BEB4
Backbone core bridges	The PBBN contains the following BCBs: <ul style="list-style-type: none"> • 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	<p>The edge switches are connected to the following BEBs:</p> <ul style="list-style-type: none"> • ES1—Connected to BEB1 and BEB2. • ES3—Connected to BEB3. • ES4—Connected to BEB4.
Backbone core bridges	<p>The PBBN contains the following BCBs:</p> <ul style="list-style-type: none"> • BCB1 • BCB2
BEB1 (Sangiovese) configuration	<p>BEB1 is physically connected to BCB1 and BCB2 in the following manner:</p> <ul style="list-style-type: none"> • Connected to BCB1 through interface ge-1/3/9 • Connected to BCB2 through interface ge-1/3/0 <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> • 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. <p>The following routing instance is configured for the I-component (PBN) for E-LAN services:</p> <ul style="list-style-type: none"> • 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. <p>The following routing instance is configured for the I-component (PBN):</p> <ul style="list-style-type: none"> • 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	<p>BEB2 is physically connected to BCB1 and BCB2 in the following manner:</p> <ul style="list-style-type: none"> Connected to BCB1 through interface ge-1/3/0 Connected to BCB2 through interface ge-2/3/0 <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> 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. <p>The following routing instance for E-LINE service is configured for the I-component (PBN):</p> <ul style="list-style-type: none"> 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	<p>BEB3 is physically connected to BCB2 through interface ge-1/3/9.</p> <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> 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. <p>The following routing instance is configured for the I-component (PBN) for E-LAN services:</p> <ul style="list-style-type: none"> 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	<p>BEB4 is physically connected to BCB1 and BCB2 in the following manner:</p> <ul style="list-style-type: none"> 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 <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> 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. <p>The following routing instance is configured for the I-component (PBN) for E-LAN services:</p> <ul style="list-style-type: none"> 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. <p>The following routing instance is configured for the I-component (PBN):</p> <ul style="list-style-type: none"> 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.
BCB1 (Syrah) configuration	<p>BCB1 is physically connected to the BEBs in the following manner:</p> <ul style="list-style-type: none"> 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 <p>The following routing instance is configured for the PBBN:</p> <ul style="list-style-type: none"> 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	<p>BCB2 is physically connected to the BEBs in the following manner:</p> <ul style="list-style-type: none"> 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 <p>The following routing instance is configured for the PBBN:</p> <ul style="list-style-type: none"> 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	<p>ES1, ES3, and ES4 are physically connected to the BEBs in the following manner:</p> <ul style="list-style-type: none"> 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
ES3 (Dolcetto) configuration	
ES4 (Reds) configuration	

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 (PBBN 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 pinot noir 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 pinot noir 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 **cbp0**:

```
[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 pinot noir 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 33](#)
- [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:
	<pre>[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</pre>
Step-by-Step Procedure	<p>To configure the PBN (I-component) routing instance for E-LINE service:</p> <ol style="list-style-type: none"> Configure the PBN routing instance pbn-1-for-eline and specify the instance type as virtual-switch to provide support for Layer 2 bridging: <pre>[edit routing-instances] user@beb2# set pbn-1-for-eline instance-type virtual-switch</pre> Configure the logical interfaces for the PBN routing instance: <pre>[edit routing-instances] user@beb2# set pbn-1-for-eline interface ge-1/0/0.1</pre> 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): <pre>[edit routing-instances] user@beb2# set pbn-1-for-eline interface pip0.0</pre> Configure the provider bridge domain eline-svlans for E-LINE services: <pre>[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</pre> Configure the peer PBBN routing instance (here, the peer PBBN is pbbn-1): <pre>[edit routing-instances] user@beb1# set pbn-1-for-eline pbb-options peer-instance pbbn-1</pre> 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): <pre>[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</pre>
Results	<p>Check the results of the configuration:</p> <pre>user@beb2> show configuration routing-instances { pbn-1-for-eline {</pre>

```

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 pinot noir 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 **cbp0**:

```

[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 38 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 38](#)
- [Configuring a PBBN Routing Instance on BEB3 \(Malbec\) on page 40](#)
- [Configuring the Interfaces on BEB3 on page 41](#)

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 **cbp0**:

```
[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 44 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 44](#)
- [Configuring a PBN Routing Instance for E-LAN Services on BEB4 on page 46](#)
- [Configuring a PBBN Routing Instance on BEB4 on page 47](#)
- [Configuring the Interfaces on BEB4 on page 49](#)

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 **eline2** 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@beb4# 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 52 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 52](#)
- [Configuring the Interfaces on ES1 on page 54](#)

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-1 instance-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 56 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 56](#)
- [Configuring the Interfaces on ES3 on page 57](#)

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-1 instance-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 58](#) 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 59](#)
- [Configuring the Interfaces on ES4 on page 60](#)

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-1 instance-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 63](#)
- [Configuring the Interfaces on BCB1 on page 64](#)

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-1 instance-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 66](#)
- [Configuring the Interfaces on BCB2 on page 68](#)

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-1 instance-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 70](#)
- [Verifying E-LINE and E-LAN Service on BEB3 on page 72](#)
- [Verifying E-LINE and E-LAN Service on BEB4 on page 74](#)
- [Verifying E-LINE and E-LAN Service on BCB1 on page 76](#)
- [Verifying E-LINE and E-LAN Service on BCB2 on page 77](#)
- [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, 01 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination 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, 01 -One svlan to 1 isid)

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination 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, 01 -One svlan to 1 isid)

PBN Bridging Domain	S-VLAN	ISID	PBBN Bridging Domain	B-VLAN	Flags
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, 01 -One svlan to 1 isid)

PBN Bridging Domain	S-VLAN	ISID	PBBN Bridging Domain	B-VLAN	Flags
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 Address	Time before expiry (SS:MS)	Flags
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 address	MAC flags	Logical 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 address	MAC flags	Logical interface	Remote 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 address	MAC flags	Logical interface	Remote 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 Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination 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 Bridging Domain	S-VLAN	ISID	PBBN Bridging Domain	B-VLAN	Flags
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 Address	Time before expiry (SS:MS)	Flags
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 address	MAC flags	Logical 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 address	MAC flags	Logical interface	Remote 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 address	MAC flags	Logical interface	Remote 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, 01 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination MAC
10400	pbn-3-for-elan	elan-svlans-vlan-1400	1400	01,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, 01 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination 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, 01 -One svlan to 1 isid)
```

PBN Bridging Domain	S-VLAN	ISID	PBBN Bridging Domain	B-VLAN	Flags
elan-svlans-vlan-1300	1300	10300	elan-bvlan	3350	M1,MP
elan-svlans-vlan-1400	1400	10400	elan-bvlan	3350	01,MP

```
PBN Routing Instance: pbn-3-for-eline
```

```
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)
```

PBN	S-VLAN	ISID	PBBN	B-VLAN	Flags
-----	--------	------	------	--------	-------

Bridging Domain			Bridging 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 Address	Time before expiry (SS:MS)	Flags
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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical interface	Remote 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 address	MAC flags	Logical interface	Remote 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 address      MAC flags      Logical
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 address      MAC flags      Logical
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@bcbl> 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 address	MAC flags	Logical 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 79](#)

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 80](#)
- [Overview and Topology on page 80](#)
- [Configuring CoS on an MX Series Router on page 84](#)
- [Verification on page 96](#)

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 81](#) 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

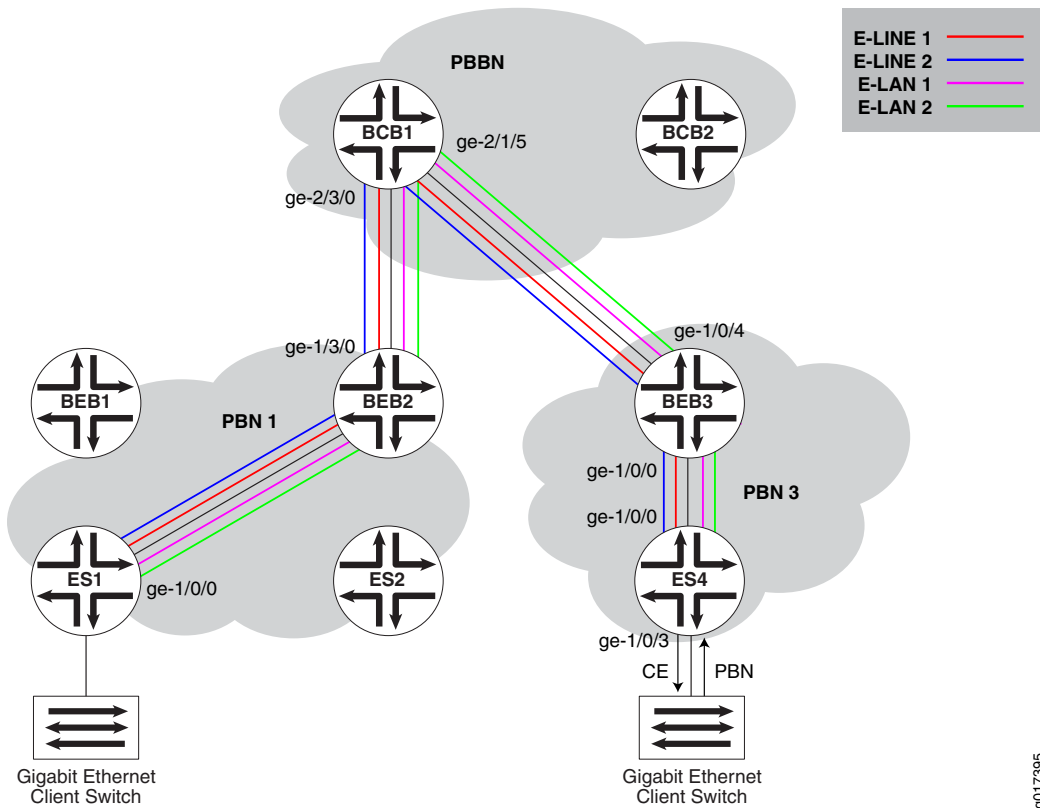


Figure 5 on page 82 shows the relationship of the forwarding classes that are used in this example. The three forwarding classes are **Voice-EF**, **VPN-PR-DATA**, and **INET-BEST-EFFORT**. These forwarding classes are associated with E-LINE 1, E-LINE 2, E-LAN 1, and E-LAN 2.

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

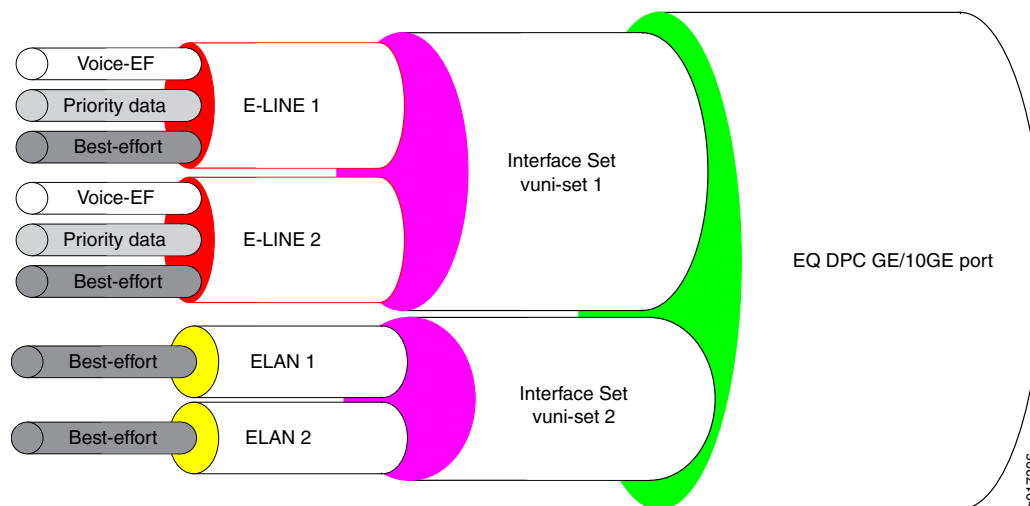


Table 9 on page 82 shows the services, traffic rates, and the egress SLA that are configured in this example.

Table 9: Egress SLA Enforcement

Service	Traffic Rate Applied for Example	Egress SLA
eline1 from ES1 → ES4 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 10 Mbps for voice • 40 Mbps for priority • 25 Mbps for best effort <p>NOTE: Traffic is limited to 100 Mbps due to the physical restrictions of the interface on which it travels.</p>
eline2 from ES1 → ES4 <ul style="list-style-type: none"> • INET-BEST-EFFORT forwarding class 	60 Mbps	25 Mbps <p>NOTE: After scheduling voice and data traffic, the remaining 50 Mbps is shared by the best effort traffic in eline1 and eline2.</p>

Ingress traffic travels into the ES4 router and through the network to the ES1 router. Figure 6 on page 83 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

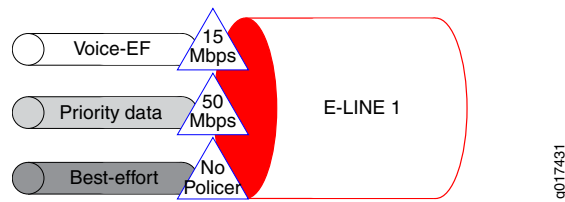


Table 10 on page 83 provides more information about the services, traffic rates, and the ingress SLA that are configured in this example.

Table 10: Ingress SLA Enforcement

Service	Traffic Rate Applied for Example	Ingress SLA
eline1 to ES4 → ES1 <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 10 Mbps for voice 70 Mbps for priority 40 Mbps for best effort 	Traffic will be policed at the following rates: <ul style="list-style-type: none"> 15 Mbps for voice 50 Mbps for priority No policer for best effort—all 40 Mbps traffic is accepted
eline2 to ES4 → ES1 <ul style="list-style-type: none"> 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 83 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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	<p>The following firewall filters are configured:</p> <ul style="list-style-type: none"> • SERVICE1 • SERVICE2 • SERVICE3
Schedule map and schedulers	<p>The schedule map EVC contains the following schedulers:</p> <ul style="list-style-type: none"> • 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 <p>The schedulers are markings that can be used by the next router to reprioritize traffic.</p>
Rewrite rules	<p>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.</p>

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 84](#)

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 create 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-802.1802p_class forwarding-class INET-BEST-EFFORT loss-priority
low code-points 000
user@es4# set ieee-802.1802p_class forwarding-class INET-BEST-EFFORT loss-priority
low code-points 001
user@es4# set ieee-802.1802p_class forwarding-class INET-BEST-EFFORT loss-priority
high code-points 010
user@es4# set ieee-802.1802p_class forwarding-class INET-BEST-EFFORT loss-priority
high code-points 011
user@es4# set ieee-802.1802p_class forwarding-class VPN-PR-DATA loss-priority low
code-points 100
user@es4# set ieee-802.1802p_class forwarding-class VPN-PR-DATA loss-priority high
code-points 101
user@es4# set ieee-802.1802p_class forwarding-class VOICE-EF loss-priority low
code-points 111
user@es4# set ieee-802.1802p_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_rerule** in the rewrite table and associate them with forwarding classes:

```

[edit class-of-service rewrite-rules \(Definition\)]
user@es4# set ieee-802.1 802p_rerule forwarding-class VPN-PR-DATA loss-priority
low code-point 010
user@es4# set ieee-802.1 802p_rerule forwarding-class VPN-PR-DATA loss-priority
high code-point 110
user@es4# set ieee-802.1 802p_rerule forwarding-class VPN-PR-DATA loss-priority
high code-point 110
user@es4# set ieee-802.1 802p_rerule forwarding-class VOICE-EF loss-priority low
code-point 011
user@es4# set ieee-802.1 802p_rerule forwarding-class VOICE-EF loss-priority high
code-point 111
user@es4# set ieee-802.1 802p_rerule forwarding-class INET-BEST-EFFORT loss-priority
low code-point 100
user@es4# set ieee-802.1 802p_rerule 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 96](#)
- [Verifying Egress SLA on page 98](#)
- [Verify Traffic Shaping and Scheduling Profiles on page 98](#)
- [Verifying Schedulers and the Scheduler Map on page 99](#)
- [Egress SLA Enforcement on page 99](#)

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_lv1_0__       0              0
__ge-1/0/3.5_cc_term_lv1_1__       0              0
__ge-1/0/3.5_cc_term_lv1_2__       0              0
__ge-1/0/3.5_lt_term_lv1_0__       0              0
__ge-1/0/3.5_lt_term_lv1_1__       0              0
__ge-1/0/3.5_lt_term_lv1_2__       0              0
__ge-1/0/3.5_cc_term_lv1_3__       0              0
__ge-1/0/3.5_cc_term_lv1_4__       0              0
__ge-1/0/3.5_cc_term_lv1_5__       0              0
__ge-1/0/3.5_cc_term_lv1_6__       0              0
__ge-1/0/3.5_cc_term_lv1_7__       0              0
__ge-1/0/3.5_lt_term_lv1_3__       0              0
__ge-1/0/3.5_lt_term_lv1_4__       0              0
__ge-1/0/3.5_lt_term_lv1_5__       0              0
__ge-1/0/3.5_lt_term_lv1_6__       0              0
__ge-1/0/3.5_lt_term_lv1_7__       0              0
__mgrp_1_cc_term_lv1_0__           0              0
__mgrp_1_cc_term_lv1_1__           0              0
__mgrp_1_cc_term_lv1_2__           0              0
__mgrp_1_cc_term_lv1_3__           111794828      1152524
__mgrp_1_cc_term_lv1_4__           0              0
__mgrp_1_cc_term_lv1_5__           0              0
__mgrp_1_cc_term_lv1_6__           0              0
__mgrp_1_cc_term_lv1_7__           0              0
__mgrp_1_lt_term_lv1_0__           0              0
__mgrp_1_lt_term_lv1_1__           0              0
__mgrp_1_lt_term_lv1_2__           0              0
__mgrp_1_lt_term_lv1_3__           1152            18
__mgrp_1_lt_term_lv1_4__           0              0
__mgrp_1_lt_term_lv1_5__           0              0
__mgrp_1_lt_term_lv1_6__           0              0
__mgrp_1_lt_term_lv1_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 103](#)

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 103](#)
- [Overview and Topology on page 103](#)
- [Configuring Connectivity Fault Management for a PBBN on page 107](#)
- [Configuring Connectivity Fault Management for a PBN on page 118](#)
- [Verification on page 126](#)

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 104 displays the topology for the PBBN. The PBBN connects 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

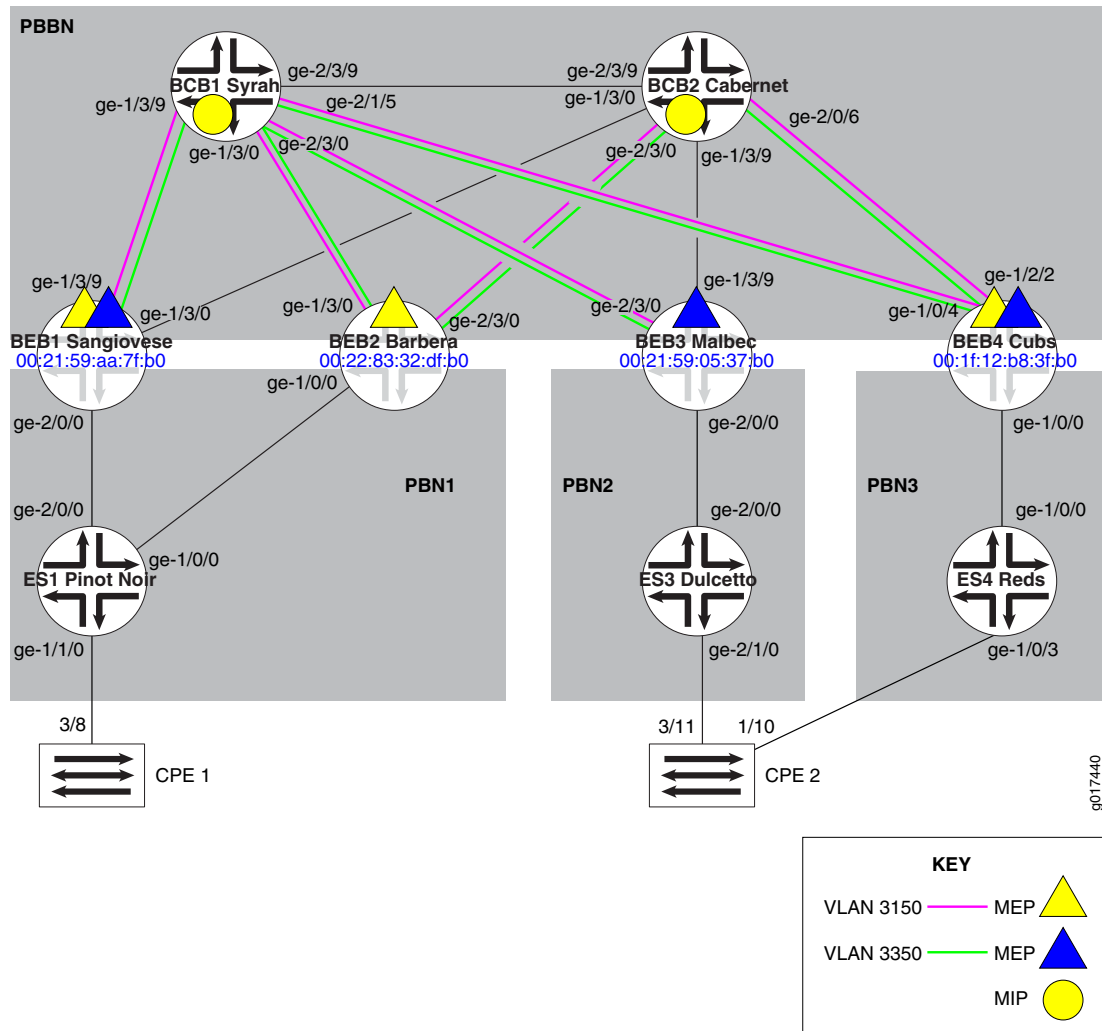


Table 12 on page 105 shows the maintenance end points (MEPs) and maintenance intermediate points (MIPs) that are configured for each router in the PBBN. The PBBN is configured with VLAN 3150 and 3350. CFM must be configured for monitoring the connectivity in both the VLANs. To do this, configure a MEP 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 106 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

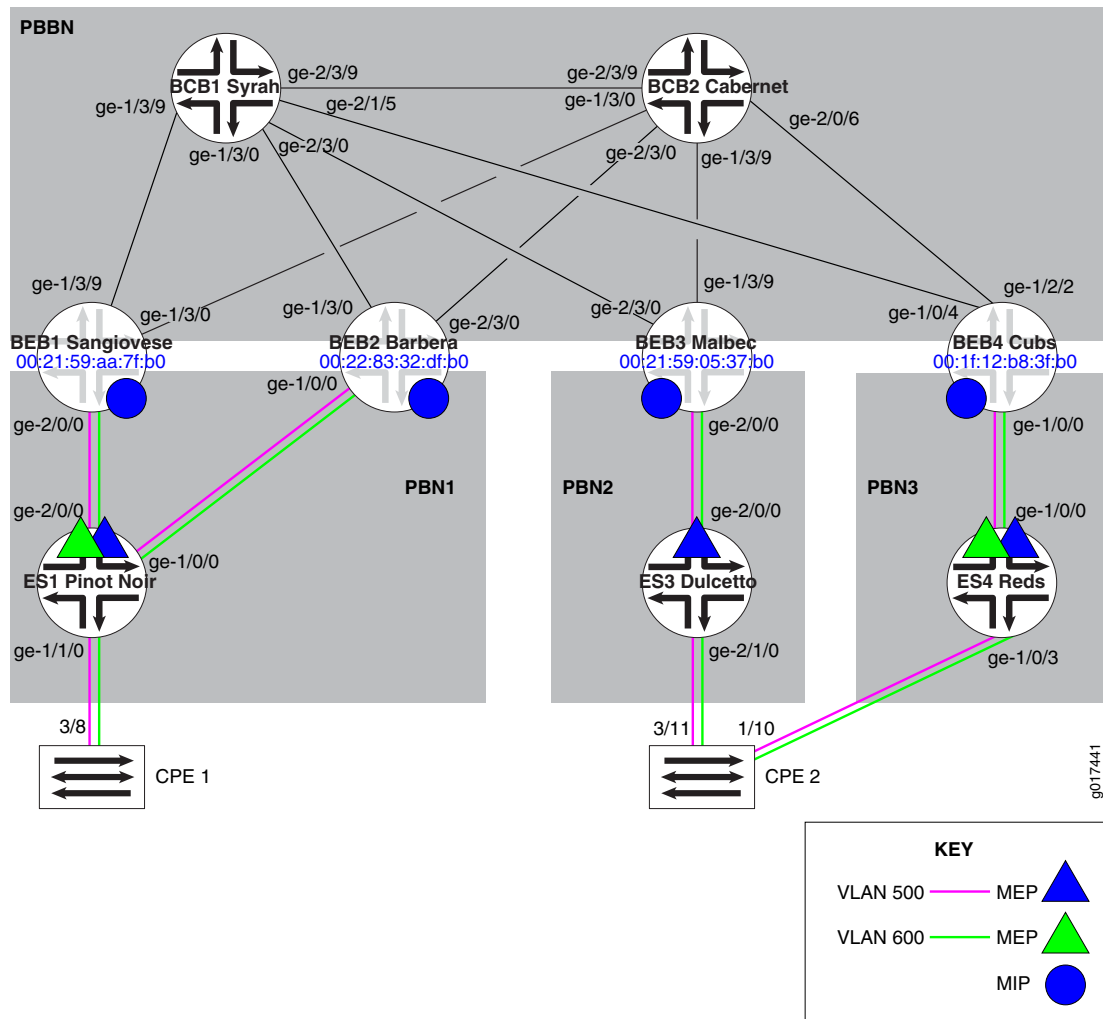


Table 13 on page 107 shows the MEPs and MIPs that are configured in the PBN.

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 108](#)
- [Configuring a MEP on BEB2 \(Barbera\) on page 110](#)
- [Configuring a MEP on BEB3 \(Malbec\) on page 112](#)
- [Configuring a MEP on BEB4 \(Cubs\) on page 113](#)
- [Configuring a MIP on BCB1 \(Syrah\) on page 116](#)
- [Configuring a MIP on BCB2 \(Cabernet\) on page 117](#)

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 118](#)
- [Configuring a MIP on BEB2 \(Barbera\) on page 119](#)
- [Configuring a MIP on BEB4 \(Cubs\) on page 120](#)
- [Configuring a MEP on ES1 \(Pinot Noir\) on page 121](#)
- [Configuring a MEP on ES4 \(Reds\) on page 124](#)

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-1 continuity-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-1 continuity-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 126](#)
- [Verifying CFM for VLAN 3350 in the PBBN on page 131](#)
- [Verifying CFM for VLAN 500 in the PBN on page 134](#)
- [Verifying CFM for VLAN 600 in the PBN on page 138](#)

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:74:8d
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@bc1> 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 79](#)

CHAPTER 5

Provider Backbone Bridging Configuration Statements

bridge-domains

Syntax	<pre> bridge-domains { bridge-domain-name { bridge-options { ...bridge-options-configuration... } domain-type bridge; interface <i>interface-name</i>; no-irb-layer-2-copy; routing-interface <i>routing-interface-name</i>; vlan-id (all none <i>number</i>); vlan-id-list [<i>vlan-id-numbers</i>]; vlan-tags outer <i>number</i> inner <i>number</i>; bridge-options { interface <i>interface-name</i> { static-mac <i>mac-address</i>; } interface-mac-limit <i>limit</i>; mac-statistics; mac-table-size <i>limit</i>; no-mac-learning; } } } </pre>
Hierarchy Level	[edit], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i>], [edit routing-instances <i>routing-instance-name</i>]
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	<i>bridge-domain-name</i> —Name of the bridge domain.
<div style="display: flex; align-items: center;">  <div> <p>NOTE: You cannot use the slash (/) character as part of the bridge domain name. If you do, the configuration will not commit.</p> </div> </div>	
<p>The remaining statements are explained separately.</p>	
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> 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 <i>pseudo-logical-interface-name</i> unit <i>logical-unit-number</i> 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	<p>bvlan—The backbone VLAN (B-VLAN) for the provider routing instance configured in the B-component.</p> <p>svlan —The service VLAN (S-VLAN) for the customer routing instance configured in the I-component.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

default-bvlan

Syntax	default-bvlan <i>vlan-id</i> ;
Hierarchy Level	[edit routing-instances <i>instance-name</i> 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	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

default-isid

Syntax	<code>default-isid <i>isid-number</i>;</code>
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups <i>service-group-name</i> 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	<i>default-isid</i> — Default service identifier. Enter an I-SID in the range from 256 through 16777214.
Required Privilege Level	<code>routing</code> —To view this statement in the configuration. <code>routing-control</code> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• 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-group group-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-address ipv6-address;
vrp-inherit-from active-group | active-interface
}
}

```

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-vs-a-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. See the *Junos OS Configuration Statements and Commands* for details about each 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 OS Services Interfaces Configuration Guide](#)

isid

Syntax	<code>isid isid-number vlan-id-list [<i>vlan-ids</i>];</code>
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups <i>service-group-name</i> 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	<p><i>isid</i>—Service identifier. Enter an I-SID in the range from 256 through 16777214.</p> <p><i>vlan-id-list [<i>vlan-ids</i>]</i>—List of service VLANs (S-VLANs).</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• 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-group group-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-address ipv6-address;  
vrp-inherit-from active-group | active-interface  
}
```

Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Option max-sessions-vs-a-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. See the *Junos OS Configuration Statements and Commands* for details about each 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 OS Services Interfaces Configuration Guide](#)

mac-address

Syntax	<code>mac-address mac-address;</code>
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 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: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i> ; for example, 0011.2233.4455 or 00:11:22:33:44:55 .
Required Privilege Level	<code>routing</code> —To view this statement in the configuration. <code>routing-control</code> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

pbb-options

Syntax	<pre>pbb-options { default-bvlan <i>vlan-id</i>; peer-instance <i>routing-instance-name</i>; vlan-id <i>vlan-id</i> <i>isid-list</i> [<i>isid-numbers</i>] }</pre>
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	<code>routing</code> —To view this statement in the configuration. <code>routing-control</code> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17



pbb-service-options

Syntax	<code>pbb-service-options { default-isid <i>isid-number</i>; isid <i>isid-number</i> <i>vlan-id-list</i> [<i>vlan-ids</i>]; mac-address <i>mac-address</i>; }</code>
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups <i>service-group-name</i>]
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	<i>service-group-name</i> —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	<ul style="list-style-type: none"> • Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

peer-instance

Syntax	<code>peer-instance <i>routing-instance-name</i>;</code>
Hierarchy Level	[edit routing-instances <i>instance-name</i> 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	<i>pbbn-instance-name</i> —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	<ul style="list-style-type: none"> • Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17

routing-instances

Syntax	<code>routing-instances <i>routing-instance-name</i> { ... }</code>
Hierarchy Level	[edit], [edit logical-systems <i>logical-system-name</i>]
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.
Default	Routing instances are disabled for the router.
Options	<p><i>routing-instance-name</i>—Name of the routing instance. This must be a non-reserved string of not more than 128 characters.</p> <p>All special characters, except spaces, are allowed.</p>
	<p> NOTE: 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.</p>
	The remaining statements are explained separately.
	<p> NOTE: In Junos OS Release 9.0 and later, you cannot specify a routing-instance name of default.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Complete Routing Instances Configuration Statements Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17 Junos OS Policy Framework Configuration Guide

service-groups

Syntax	<pre> 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); } } </pre>
Hierarchy Level	[edit routing-instances routing-instance-name]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	<p>For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service groups to be supported in the customer routing instance (I-component).</p> <p>The remaining statements are explained separately.</p>
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	<ul style="list-style-type: none"> • 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 <i>routing-instance-name</i> 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	<p>elan—Connects a set of customer endpoints (like a bridged Ethernet network). E-LAN service is also known as point-to-multipoint service.</p> <p>eline—Connects two customer Ethernet ports over a WAN. E-LINE service is also known as point-to-point service.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• 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 | 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 {
        dlc 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 <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i>], [edit interfaces interface-set <i>interface-set-name</i> interface <i>interface-name</i>]
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	<i>logical-unit-number</i> —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 OS Services Interfaces Configuration Guide](#)

vlan-id (Provider Backbone Bridge)

Syntax	<code>vlan-id <i>vlan-id</i> isid-list [<i>isid-numbers</i>];</code>
Hierarchy Level	[edit routing-instances <i>instance-name</i> 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	<p><i>vlan-id</i>—Configure the B-VLAN in the range from 0 through 4094.</p> <p><i>isid-list [isid-numbers]</i>—I-SIDs for the B-VLAN routing instance. Specify one or more values in the range from 256 through 16777214.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• 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 <i>number</i>);
Hierarchy Level	[edit bridge-domains <i>bridge-domain-name</i>], [edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i>], [edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i>]
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 logical systems added in Junos OS Release 9.6.
Description	(MX Series routers only) Specify a VLAN identifier (VID) to include in the packets sent to and from the bridge domain or a VPLS routing instance.
<div>  <p>NOTE: When configuring a VLAN identifier for provider backbone bridge (PBB) routing instances, dual-tagged VIDs and the none option are not permitted.</p> </div>	
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.
<div>  <p>NOTE: If you specify a VLAN identifier, you cannot also use the all option. They are mutually exclusive.</p> </div>	
	all —Specify that the bridge domain spans all the VLAN identifiers configured on the member logical interfaces.
<div>  <p>NOTE: You cannot specify the all option if you include a routing interface in the bridge domain.</p> </div>	
	none —Specify to enable shared VLAN learning or to send untagged frames over VPLS VT interfaces.
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](#)

CHAPTER 6

Connectivity Fault Management Configuration Statements

- [\[edit protocols oam\] Hierarchy Level on page 171](#)

[\[edit protocols oam\] 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);
      loss-threshold 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 <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i>]
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	<ul style="list-style-type: none"> Configuring a Maintenance Endpoint Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103

bridge-domain

Syntax	bridge-domain <i>name</i> ; vlan-id [<i>vlan-identifiers</i>]; }
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>maintenance-domain-name</i>], [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>maintenance-domain-name</i> virtual-switch <i>virtual-switch-name</i>]
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	<i>name</i> —Specify the name of the bridge domain. <i>vlan-identifiers</i> —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	<ul style="list-style-type: none"> Configuring Maintenance Intermediate Points Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103 maintenance-domain on page 187

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);
                loss-threshold 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 103](#)

continuity-check

Syntax	<pre>continuity-check { convey-loss-threshold; hold-interval <i>minutes</i>; interface-status-tlv; interval (10m 10s 1m 1s 100ms 10ms); loss-threshold <i>number</i>; port-status-tlv; }</pre>
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i>]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	Specify continuity check protocol options.
Options	<p>convey-loss-threshold—Enable loss-threshold-tlv transmission.</p> <p>hold-interval <i>minutes</i>—Specify the continuity check hold-interval, in minutes.</p> <p>interface-status-tlv—Enable interface-status-tlv transmission.</p> <p>interval (<i>10m 10s 1m 1s 100ms 10ms</i>)—Specify the continuity check interval.</p> <p>loss-threshold <i>minutes</i>—Specify the loss-threshold, in minutes.</p> <p>port-status-tlv—Enable port-status-tlv transmission.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">Continuity Check ProtocolExample: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103

direction

Syntax	direction (up down);
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep mep-id]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	Configure the direction of the MEP.
Options	<p>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.</p> <p>down—Down MEP CCMs are transmitted only out the interface configured on this MEP.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring a Maintenance Endpoint• Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103• 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);
                loss-threshold 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 {
```

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```
    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 103](#)

interface (IEEE 802.1ag OAM Connectivity-Fault Management)

Syntax	<code>interface (interface-name ((ge- xe-) (fpc/pic/port fpc/pic/port.unit-number fpc/pic/port.unit-number vlan vlan-id)));</code>
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep mep-id]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	<p>For Ethernet interfaces on M320, MX Series, and T Series routers, configure IEEE 802.1ag Operation, Administration, and Management (OAM) support.</p> <p>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.</p>
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	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring a Maintenance Endpoint Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103

interval

Syntax	interval (10m 10s 1m 1s 100ms 10ms);
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> 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	<ul style="list-style-type: none">Continuity Check ProtocolExample: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103

level

Syntax	<code>level <i>number</i>;</code>
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i>]
Release Information	Statement introduced in Junos OS Release 8.4. Statement introduced in Junos OS Release 12.1 for PTX Series Packet Transport Switches.
Description	A number used in CFM messages to identify the maintenance association.
Options	<i>number</i> —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	<ul style="list-style-type: none">Configuring the Maintenance Domain LevelExample: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

maintenance-association

Syntax	<pre> maintenance-association <i>ma-name</i> { short-name-format (character-string vlan 2octet rfc-2685-vpn-id); protect-maintenance-association <i>protect-ma-name</i>; remote-maintenance-association <i>remote-ma-name</i>; continuity-check { hold-interval <i>minutes</i>; interval (10m 10s 1m 1s 100ms); loss-threshold <i>number</i>; } mep <i>mep-id</i> { auto-discovery; direction (up down); interface <i>interface-name</i> (protect working); lowest-priority-defect (all-defects err-xcon mac-rem-err-xcon no-defect rem-err-xcon xcon); priority <i>number</i>; remote-mep <i>mep-id</i> { action-profile <i>profile-name</i>; sla-iterator-profile <i>profile-name</i> { data-tlv-size <i>size</i>; iteration-count <i>count-value</i>; priority <i>priority-value</i>; } } } } </pre>
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i>]
Release Information	Statement introduced in Junos OS Release 8.4. Statement introduced in Junos OS Release 12.1 for PTX Series Packet Transport Switches.
Description	Configure the name of the maintenance association in IEEE-compliant format.
Options	<p>ma-name—The name of the maintenance association within the maintenance domain.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Creating a Maintenance Association Configuring a Maintenance Endpoint Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103 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);`
 `loss-threshold 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 12.1 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 interface—To view this statement in the configuration.
Level 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 103](#)
 - Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

mep

Syntax	<pre>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; } } }</pre>
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	<p>mep-id—Specify the numeric identifier of the MEP.</p> <p>Range: 1 through 8191</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring a Maintenance Endpoint• Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103

mip-half-function

Syntax	mip-half-function (none default explicit);
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management <i>md-name</i>], [edit protocols oam ethernet connectivity-fault-management <i>ma-name</i>]
Release Information	Statement introduced in Junos OS Release 9.6.
Description	Specify the OAM Ethernet CFM maintenance domain MIP half functions.
	<div>  <p>NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains or maintenance associations, it is essential that the <code>mip-half-function</code> value for all maintenance domains and maintenance associations are the same.</p> </div>
Options	<p>none—Specify to not use the mip-half-function.</p> <p>default—Specify to use the default mip-half-function.</p> <p>explicit—Specify an explicit mip-half-function.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Creating the Maintenance Domain • Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103 • maintenance-domain on page 187

virtual-switch

Syntax	<code>virtual-switch <i>name</i> bridge-domain <i>name</i> vlan-id [<i>vlan-ids</i>];</code>
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> 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	<ul style="list-style-type: none">Configuring MIP for Bridge Domains of a Virtual SwitchExample: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 103

CHAPTER 7

CoS Configuration Statements

buffer-size

Syntax	buffer-size (percent <i>percentage</i> remainder temporal <i>microseconds</i>);
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify buffer size.
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.
Options	<p>percent <i>percentage</i>—Buffer size as a percentage of total buffer.</p> <p>remainder—Remaining buffer available.</p> <p>temporal <i>microseconds</i>—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.</p> <p>Range: The ranges vary by platform as follows:</p> <ul style="list-style-type: none">• For M320 and T Series routers with Type 1 and Type 2 FPCs: 1 through 80,000 microseconds.• For M320 and T Series routers with Type 3 FPCs: 1 through 50,000 microseconds.• For M7i, M10i, M5, and M10 routers: 1 through 100,000 microseconds.• For other M Series routers: 1 through 200,000 microseconds.• For IQ PICs on M320 and T Series routers: 1 through 50,000 microseconds.• For IQ PICs on other M Series routers: 1 through 100,000 microseconds.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Scheduler Buffer Size• Example: Configuring CoS for a PBB Network on MX Series Routers on page 79

classifiers (Definition)

Syntax	<pre> classifiers { type classifier-name { import (classifier-name default); forwarding-class class-name { loss-priority level code-points [aliases] [bit-patterns]; } } } </pre>
Hierarchy Level	[edit class-of-service], [edit class-of-service routing-instances <i>routing-instance-name</i>]
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 aggregate behavior 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.
Options	<p>classifier-name—Name of the aggregate behavior classifier.</p> <p>type—Traffic type: dscp, dscp-ipv6, exp, ieee-802.1, ieee-802.1ad, inet-precedence.</p>
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Overview of BA Classifier Types Example: Configuring CoS for a PBB Network on MX Series Routers on page 79

code-point

Syntax	<code>code-point [<i>aliases</i>] [<i>bit-patterns</i>];</code>
Hierarchy Level	<code>[edit class-of-service rewrite-rules <i>type rewrite-name</i> forwarding-class <i>class-name</i>]</code>
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	<p><i>aliases</i>—Name of each alias.</p> <p><i>bit-patterns</i>—Value of the code-point bits, in decimal form.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">Configuring Rewrite Rules

code-points

Syntax	<code>code-points ([<i>aliases</i>] [<i>bit-patterns</i>]);</code>
Hierarchy Level	<code>[edit class-of-service classifiers <i>type classifier-name</i> forwarding-class <i>class-name</i>]</code>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify one or more DSCP code-point aliases or bit sets for association with a forwarding class.
Options	<p><i>aliases</i>—Name of the DSCP alias.</p> <p><i>bit-patterns</i>—Value of the code-point bits, in six-bit binary form.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">Overview of BA Classifier TypesExample: Configuring CoS for a PBB Network on MX Series Routers on page 79

family

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.
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	<pre> filter <i>filter-name</i> { accounting-profile <i>name</i>; enhanced-mode; interface-specific; physical-interface-filter; term <i>term-name</i> { filter <i>filter-name</i>; from { <i>match-conditions</i>; } then { <i>actions</i>; } } } </pre>
Hierarchy Level	<p>[edit dynamic-profiles <i>profile-name</i> firewall family <i>family-name</i>];</p> <p>[edit firewall family <i>family-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> firewall family <i>family-name</i>]</p>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Logical systems support introduced in Junos OS Release 9.3.</p> <p>physical-interface-filter statement introduced in Junos OS Release 9.6.</p> <p>Support at the [edit dynamic-profiles ... family <i>family-name</i>] hierarchy level introduced in Junos OS Release 11.4.</p>
Description	Configure firewall filters.
Options	<p><i>filter-name</i>—Name that identifies the filter. This must be a non-reserved string of not more than 64 characters. No special characters are restricted. However, to include spaces in the name, enclose it in quotation marks (" ").</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>firewall—To view this statement in the configuration.</p> <p>firewall-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Guidelines for Configuring Standard Firewall Filters Guidelines for Applying Standard Firewall Filters

firewall

Syntax	firewall { ... }
Hierarchy Level	[edit], [edit logical-systems <i>logical-system-name</i>] [edit dynamic-profiles <i>profile-name</i>],
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	<ul style="list-style-type: none">• Guidelines for Configuring Standard Firewall Filters• Guidelines for Configuring Service Filters• Guidelines for Configuring Simple Filters

forwarding-classes

Syntax	<pre>forwarding-classes { class queue-num <i>queue-number</i> priority (high low); queue <i>queue-number class-name</i> priority (high low) [policing-priority (premium normal)]; }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>policing-priority option introduced in Junos OS Release 9.5.</p> <p>Statement introduced on PTX Series Packet Transport Switches in Junos OS Release 12.1.</p>
Description	<p>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.</p>
<div style="display: flex; align-items: center;">  <div> <p>NOTE: The priority and policing-priority options are not supported on PTX Series Packet Transport Switches.</p> </div> </div>	
<p>The statements are explained separately.</p>	
Usage Guidelines	<p>See Configuring Forwarding Classes, Overriding Fabric Priority Queuing, and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 79. For the policing-priority option, see Configuring Layer 2 Policers on IQE PICs. For classification by egress interface, see Classifying Packets by Egress Interface.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

ieee-802.1

Syntax	<code>ieee-802.1 (rewrite-name default) vlan-tag (outer outer-and-inner);</code>
Hierarchy Level	<code>[edit class-of-service interfaces interface-name unit logical-unit-number rewrite-rules]</code>
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 <code>[edit class-of-service rewrite-rules ieee-802.1]</code> 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	<ul style="list-style-type: none">Configuring Rewrite RulesExample: Configuring CoS for a PBB Network on MX Series Routers on page 79dscp (Rewrite Rules)dscp-ipv6expexp-push-push-pushexp-swap-push-pushieee-802.1adinet-precedencerewrite-rules (Definition) on page 207

interfaces

Syntax	<code>interfaces { ... }</code>
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	<ul style="list-style-type: none"> Physical Interface Configuration Statements Overview Configuring Aggregated Ethernet Link Protection

interface-set

Syntax	<pre>interface-set <i>interface-set-name</i> { excess-bandwidth-share (proportional <i>value</i> equal); internal-node; output-traffic-control-profile <i>profile-name</i>; output-traffic-control-profile-remaining <i>profile-name</i>; }</pre>
Hierarchy Level	[edit class-of-service interfaces]
Release Information	Statement introduced in Junos OS Release 8.5.
Description	For MX Series routers with Enhanced Queuing DPCs or MPC/MIC interfaces and M Series and T Series routers with IQ2E PIC, configure hierarchical schedulers for an interface set.
Options	<p><i>interface-set-name</i>—Name of the interface set.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring Interface Sets Configuring Hierarchical Schedulers for CoS

interface-set (Ethernet Interfaces)

Syntax	<pre>interface-set <i>interface-set-name</i> { interface <i>ethernet-interface-name</i> { (unit <i>unit-number</i> vlan-tags-outer <i>vlan-tag</i>); } }</pre>
Hierarchy Level	[edit interfaces]
Release Information	Statement introduced in Junos OS Release 8.5.
Description	<p>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.</p> <p>The remaining statements are described separately.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• 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	<code>loss-priority <i>level</i>;</code>
Hierarchy Level	<code>[edit class-of-service rewrite-rules <i>type rewrite-name</i> forwarding-class <i>class-name</i>]</code>
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	<p><i>level</i> can be one of the following:</p> <ul style="list-style-type: none"> • 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.
Usage Guidelines	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 79 .
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

loss-priority (BA Classifiers)

Syntax	loss-priority <i>level</i> ;
Hierarchy Level	[edit class-of-service classifiers <i>type classifier-name</i> forwarding-class <i>class-name</i>]
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	<i>level</i> can be one of the following: <ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Overview of BA Classifier Types• Example: Configuring CoS for a PBB Network on MX Series Routers on page 79• Configuring Tricolor Marking

output-traffic-control-profile

Syntax	<code>output-traffic-control-profile <i>profile-name</i> shared-instance <i>instance-name</i>;</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i>], [edit class-of-service interfaces <i>interface-name</i> interface-set <i>interface-set-name</i>]
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 MPC/MIC interfaces on MX Series routers in Junos OS Release 10.2.
Description	For Channelized IQ PICs, Gigabit Ethernet IQ, Gigabit Ethernet IQ2, and IQ2E PICs, link services IQ (LSQ) interfaces on AS PICs, and Enhanced Queuing DPCs and MPC/MIC 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	<i>profile-name</i> —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	<ul style="list-style-type: none"> • 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 79 • Configuring Hierarchical Schedulers for CoS (Enhanced Queuing DPCs and MPC/MIC interfaces on MX Series routers) • Configuring Interface Sets (Enhanced Queuing DPCs and MPC/MIC interfaces on MX Series routers) • output-traffic-control-profile-remaining • traffic-control-profiles on page 213

policer (Configuring)

Syntax	<pre> policer <i>policer-name</i> { filter-specific; if-exceeding { bandwidth-limit <i>bps</i>; bandwidth-percent <i>number</i>; burst-size-limit <i>bytes</i>; } logical-interface-policer; physical-interface-policer; then { <i>policer-action</i>; } } </pre>
Hierarchy Level	<p>[edit dynamic-profiles <i>profile-name</i> firewall], [edit firewall], [edit logical-systems <i>logical-system-name</i> firewall]</p>
Release Information	<p>Statement introduced before Junos OS Release 7.4. Logical systems support introduced in Junos OS Release 9.3. physical-interface-policer statement introduced in Junos OS Release 9.6. Support at the [edit dynamic-profiles ... firewall] hierarchy level introduced in Junos OS Release 11.4.</p>
Description	<p>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.</p>
Options	<p><i>policer-action</i>—One or more actions to take:</p> <ul style="list-style-type: none"> • discard—Discard traffic that exceeds the rate limits. • forwarding-class <i>class-name</i>—Specify the particular forwarding class. • loss-priority—Set the packet loss priority (PLP) to low, medium-low, medium-high, or high. <p><i>policer-name</i>—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 (" ").</p> <p>then—Actions to take on matching packets.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>firewall—To view this statement in the configuration. firewall-control—To add this statement to the configuration.</p>

- Related Documentation**
- Statement Hierarchy for Configuring Policers
 - Single-Rate Two-Color Policer Overview
 - Bandwidth Policer Overview
 - Physical Interface Policer Overview
 - Logical Interface (Aggregate) Policer Overview

rewrite-rules (Definition)

Syntax	<pre>rewrite-rules { type <i>rewrite-name</i>{ import (<i>rewrite-name</i> default); forwarding-class <i>class-name</i> { <i>loss-priority level code-point</i> [<i>aliases</i>] [<i>bit-patterns</i>]; } } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before Junos OS Release 7.4. <i>ieee-802.1ad</i> 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	<p><i>rewrite-name</i>—Name of a <i>rewrite-rules</i> mapping.</p> <p><i>type</i>—Traffic type.</p> <p>Values: <i>dscp</i>, <i>dscp-ipv6</i>, <i>exp</i>, <i>frame-relay-de</i> (J Series routers only), <i>ieee-802.1</i>, <i>ieee-802.1ad</i>, <i>inet-precedence</i></p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p><i>interface</i>—To view this statement in the configuration.</p> <p><i>interface-control</i>—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Rewrite Rules • Example: Configuring CoS for a PBB Network on MX Series Routers on page 79 • J Series router documentation

scheduler (Scheduler Map)

Syntax	<code>scheduler <i>scheduler-name</i>;</code>
Hierarchy Level	[edit class-of-service scheduler-maps <i>map-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Associate a scheduler with a scheduler map.
Options	<i>scheduler-name</i> —Name of the scheduler configuration block.
Usage Guidelines	See Configuring Schedulers and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 79.
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	<pre>scheduler-maps { <i>map-name</i> { forwarding-class <i>class-name</i> scheduler <i>scheduler-name</i>; } }</pre>
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	<i>map-name</i> —Name of the scheduler map. The remaining statements are explained separately.
Usage Guidelines	See Configuring Schedulers and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 79.
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	<pre>scheduler-maps { map-name { forwarding-class class-name scheduler scheduler-name; } }</pre>
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	<p><i>map-name</i>—Name of the scheduler map.</p> <p>The remaining statements are explained separately.</p>
Usage Guidelines	See Configuring Schedulers and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 79 .
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	<pre>schedulers { scheduler-name { adjust-minimum <i>rate</i>; adjust-percent <i>percentage</i>; buffer-size (<i>seconds</i> percent <i>percentage</i> remainder temporal <i>microseconds</i>); drop-profile-map loss-priority (any low medium-low medium-high high) protocol (any non-tcp tcp) drop-profile <i>profile-name</i>; excess-priority [low medium-low medium-high high none]; excess-rate percent <i>percentage</i>; excess-rate (percent <i>percentage</i> proportion <i>value</i>); priority <i>priority-level</i>; shaping-rate (percent <i>percentage</i> <i>rate</i>); transmit-rate (percent <i>percentage</i> <i>rate</i> remainder) <exact rate-limit>; } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify scheduler name and parameter values.
Options	<p>scheduler-name—Name of the scheduler to be configured.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Configuring SchedulersExample: Configuring CoS for a PBB Network on MX Series Routers on page 79

term

Syntax	<pre> term <i>term-name</i> { from { <i>match-conditions</i>; ip-version ipv4 { <i>match-conditions-mpls-ipv4-address</i>; protocol (tcp udp) { <i>match conditions-mpls-ipv4-port</i>; } } } then { <i>actions</i>; } } </pre>
Hierarchy Level	<p>[edit firewall family <i>family-name</i> filter <i>filter-name</i>],</p> <p>[edit firewall family <i>family-name</i> service-filter <i>filter-name</i>],</p> <p>[edit firewall family <i>family-name</i> simple-filter <i>filter-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> firewall family <i>family-name</i> filter <i>filter-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> firewall family <i>family-name</i> service-filter <i>filter-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> firewall family <i>family-name</i> simple-filter <i>filter-name</i>]</p>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>filter option introduced in Junos OS Release 7.6.</p> <p>Logical systems support introduced in Junos OS Release 9.3.</p> <p>ip-version ipv4 support introduced in Junos OS Release 10.1.</p>
Description	Define a firewall filter term.
Options	<p>actions—(Optional) Actions to perform on the packet if conditions match. You can specify one <i>terminating action</i> 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 <i>nonterminating actions</i> supported for the specified filter type.</p> <p>filter-name—(Optional) For family <i>family-name</i> filter <i>filter-name</i> only, reference another standard stateless firewall filter from within this term.</p> <p>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.</p> <p>match-conditions—One or more conditions to use to make a match on a packet.</p> <p>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.</p>

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	firewall—To view this statement in the configuration.
Level	firewall-control—To add this statement to the configuration.

Related Documentation	<ul style="list-style-type: none">• 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
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traffic-control-profiles

Syntax	<pre> traffic-control-profiles <i>profile-name</i> { adjust-minimum <i>rate</i>; atm-service (cbr rtvbr nrtvbr); delay-buffer-rate (percent <i>percentage</i> <i>rate</i>); peak-rate <i>rate</i>; sustained-rate <i>rate</i>; max-burst-size <i>cells</i>; excess-rate (percent <i>percentage</i> proportion <i>value</i>); excess-rate-high (percent <i>percentage</i> proportion <i>value</i>); excess-rate-low (percent <i>percentage</i> proportion <i>value</i>); guaranteed-rate (percent <i>percentage</i> <i>rate</i>) <burst-size <i>bytes</i>>; overhead-accounting (frame-mode cell-mode) <bytes <i>byte-value</i>>; scheduler-map <i>map-name</i>; shaping-rate (percent <i>percentage</i> <i>rate</i>) <burst-size <i>bytes</i>>; }</pre>
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, Enhanced Queuing (EQ) DPCs, and Clear-channel Multi-Rate ATM MICs only, configure traffic shaping and scheduling profiles. For Enhanced EQ PICs and EQ DPCs only, you can include the excess-rate statement.
Options	<p><i>profile-name</i>—Name of the traffic-control profile.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Oversubscribing Interface Bandwidth • Example: Configuring CoS for a PBB Network on MX Series Routers on page 79 • output-traffic-control-profile on page 205

transmit-rate

Syntax	<code>transmit-rate (rate percent <i>percentage</i> remainder) <exact rate-limit>;</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
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.
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.
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. percent <i>percentage</i> —Percentage of transmission capacity. A percentage of zero drops all packets in the queue. Range: 0 through 100 percent. 0 through 200 percent for 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 only configure a *percentage* value 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 `schedulers` *scheduler-name*] hierarchy is ineffective on T4000 routers with Type 5 FPC.

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.

remainder—Use remaining rate available.

Required Privilege	interface—To view this statement in the configuration.
Level	interface-control—To add this statement to the configuration.

Related Documentation	<ul style="list-style-type: none">• Configuring Schedulers• Example: Configuring CoS for a PBB Network on MX Series Routers on page 79
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CHAPTER 8

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

Syntax	<pre>interface-set <i>interface-set-name</i> { excess-bandwidth-share (proportional <i>value</i> equal); internal-node; output-traffic-control-profile <i>profile-name</i>; output-traffic-control-profile-remaining <i>profile-name</i>; }</pre>
Hierarchy Level	[edit class-of-service interfaces]
Release Information	Statement introduced in Junos OS Release 8.5.
Description	For MX Series routers with Enhanced Queuing DPCs or MPC/MIC interfaces and M Series and T Series routers with IQ2E PIC, configure hierarchical schedulers for an interface set.
Options	<p><i>interface-set-name</i>—Name of the interface set.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">Configuring Interface SetsConfiguring Hierarchical Schedulers for CoS

PART 3

Administration

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- [CoS Monitoring Commands on page 255](#)
- [Connectivity Fault Management Monitoring Commands on page 273](#)

CHAPTER 9

Provider Backbone Bridging Monitoring Commands

show bridge mac-table

Syntax	<pre>show bridge mac-table <brief count detail extensive> <bridge-domain (all <i>bridge-domain-name</i>)> <global-count> <interface <i>interface-name</i>> <mac-address> <vlan-id (all-vlan <i>vlan-id</i>)></pre>
Release Information	Command introduced in Junos OS Release 8.4.
Description	(MX Series routers only) Display Layer 2 MAC address information.
Options	<p>none—Display all learned Layer 2 MAC address information.</p> <p>brief count detail extensive—(Optional) Display the specified level of output.</p> <p>bridge-domain (all <i>bridge-domain-name</i>)—(Optional) Display learned Layer 2 MAC addresses for all bridging domains or for the specified bridging domain.</p> <p>global-count—(Optional) Display the total number of learned Layer 2 MAC addresses on the system.</p> <p>instance <i>instance-name</i>—(Optional) Display learned Layer 2 MAC addresses for the specified routing instance.</p> <p>interface <i>interface-name</i>—(Optional) Display learned Layer 2 MAC addresses for the specified interface.</p> <p>mac-address—(Optional) Display the specified learned Layer 2 MAC address information.</p> <p>vlan-id (all-vlan <i>vlan-id</i>)—(Optional) Display learned Layer 2 MAC addresses for all VLANs or for the specified VLAN.</p>
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 223 show bridge mac-table brief on page 224 show brief mac-table count on page 224 show bridge mac-table detail on page 224
Output Fields	Table 14 on page 223 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: <ul style="list-style-type: none"> • 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 user@host> show bridge mac-table brief
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 user@host> show bridge mac-table count
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 user@host> show bridge mac-table detail
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	<pre>show interfaces <i>ge-fpc/pic/port</i> <brief detail extensive terse> <descriptions> <media> otn-options { bytes { transmit-payload-type <i>number</i>; } } <snmp-index <i>snmp-index</i>> <statistics></pre>
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	<p><i>ge-fpc/pic/port</i>—Display standard information about the specified Gigabit Ethernet interface.</p> <p>brief detail extensive terse—(Optional) Display the specified level of output.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index <i>snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
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
List of Sample Output	show interfaces (Gigabit Ethernet) on page 240 show interfaces (Gigabit Ethernet on MX Series Router) on page 240 show interfaces brief (Gigabit Ethernet) on page 240 show interfaces detail (Gigabit Ethernet) on page 241 show interfaces extensive (Gigabit Ethernet IQ2) on page 242 show interfaces (Gigabit Ethernet Unnumbered Interface) on page 245
Output Fields	See Table 15 on page 226 for the output fields for the show interfaces (Gigabit Ethernet) command. For Gigabit Ethernet IQ and IQE PICs, the traffic and MAC statistics vary by interface type. For more information, see Table 16 on page 239 .

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: <ul style="list-style-type: none"> • 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.	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 specified
Output Rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • 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. <p>Gigabit Ethernet and 10-Gigabit Ethernet IQ PICs count the overhead and CRC bytes.</p> <p>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.</p>	detail extensive

Table 15: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
Input errors	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • 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 the 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	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • 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)	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> • 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)	<p>CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces.</p> <ul style="list-style-type: none"> • 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	<p>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.</p> <ul style="list-style-type: none"> • 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
OTN FEC statistics	<p>The forward error correction (FEC) counters provide the following statistics:</p> <ul style="list-style-type: none"> • 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. 	
PCS statistics	<p>(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device.</p> <ul style="list-style-type: none"> • 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 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	<p>Receive and Transmit statistics reported by the PIC's MAC subsystem, including the following:</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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. • 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	<p>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.</p> <ul style="list-style-type: none"> • 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	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> • 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. <p>Subfields are:</p> <ul style="list-style-type: none"> • 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	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> • 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. <p>Subfields are:</p> <ul style="list-style-type: none"> • 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	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> • 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. State other than OK indicates a problem. <p>Subfields are:</p> <ul style="list-style-type: none"> • 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	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> • 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. <p>Subfields are:</p> <ul style="list-style-type: none"> • 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	<p>Information about link autonegotiation.</p> <ul style="list-style-type: none"> • Negotiation status: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<p>(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.</p>	extensive
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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	<p>Rewrite profile applied to incoming or outgoing frames on the outer (Out) VLAN tag or for both the outer and inner (In) VLAN tags.</p> <ul style="list-style-type: none"> • 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:	<p>IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following:</p> <ul style="list-style-type: none"> • Source Family Inet • Destination Family Inet 	detail extensive none
Encapsulation	Encapsulation on the logical interface.	All levels
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 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 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
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

Table 15: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
Traffic statistics	Number and rate of bytes and packets received and transmitted on the specified interface set. <ul style="list-style-type: none"> • 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 parenthesis next to all interfaces.	detail extensive
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 parenthesis 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

Table 15: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<i>protocol-family</i>	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 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 includes 6 bytes for the destination MAC address + 4 bytes for VLAN + 2 bytes for the Ethernet type.
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      user@host> show interfaces ge-3/0/2
(Gigabit Ethernet)  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      user@host> show interfaces ge-2/2/2
(Gigabit Ethernet on  Physical interface: ge-2/2/2, Enabled, Physical link is Up
MX Series Router)   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 brief user@host> show interfaces ge-3/0/2 brief
(Gigabit Ethernet)  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 extensive ge-7/1/3
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:
  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 226](#).

show interfaces
(Gigabit Ethernet
Unnumbered
Interface)

```

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
  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 l2-learning backbone-instance

Syntax	<pre>show l2-learning backbone-instance <bridge-domain-name> <isid [isid-number] all-isid> <instance [instance-name]> <logical-system [system-name all]></pre>
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	<p>bridge-domain-name—(Optional) Display information for a specified bridge domain.</p> <p>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.</p> <p>all-isid—Display MAC addresses learned on all I-SIDs.</p> <p>instance instance-name—(Optional) Display information for a specified instance.</p> <p>logical-system [system-name all]—(Optional) Display information for a specified logical system or all systems.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • show l2-learning remote-backbone-edge-bridge on page 252 • show l2-learning provider-instance on page 249 • Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
List of Sample Output	<p>show l2-learning backbone-instance on page 247</p> <p>show l2-learning backbone-instance instance on page 247</p> <p>show l2-learning backbone-instance isid on page 248</p> <p>show l2-learning backbone-instance logical-system on page 248</p>
Output Fields	<p>Table 17 on page 246 describes the output fields for the show l2-learning instance command. Output fields are listed in the approximate order in which they appear.</p>

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: <ul style="list-style-type: none"> • 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

```

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   Instance Bridging   Domain   S-VLAN  Destination
Instance
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   Instance Bridging   Domain   S-VLAN  Destination
Instance
301        vin1      bd101       101      M1,MP  01:1e:86:00:01:2d

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   Instance Bridging   Domain   S-VLAN  Destination
Instance
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, 01 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Instance Bridging      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, 01 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Instance Bridging      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, 01 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Instance Bridging      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, 01 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Instance Bridging      Domain   MAC
301      vin1     bd101         101     M1,MP  01:1e:86:00:01:2d

```

show l2-learning provider-instance

Syntax	<code>show l2-learning provider-instance</code> <code><isid [<i>isid-number</i>] all-isid></code> <code><instance [<i>instance-name</i>]></code> <code><logical-system [<i>system-name</i> all]></code>
Release Information	(MX-series routers only) Command introduced in Junos Release 10.0.
Description	Displays the provider instance (I-component).
Options	<p>none—Display information for all authenticator ports.</p> <p>isid <i>isid-number</i>—(Optional) Display MAC addresses learned on a specified service identifier (I-SID). The I-SID value can be from 256 through 16777215.</p> <p>all-isid—Display MAC addresses learned on all I-SIDs.</p> <p>instance <i>instance-name</i>—(Optional) Display information for a specified instance.</p> <p>logical-system [<i>system-name</i> all]—(Optional) Display information for a specified logical system or all systems.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • show l2-learning backbone-instance on page 246 • show l2-learning remote-backbone-edge-bridge on page 252 • 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 250 show l2-learning provider-instance instance on page 250 show l2-learning provider-instance isid on page 250 show l2-learning provider-instance instance logical-system on page 251
Output Fields	Table 18 on page 249 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: <ul style="list-style-type: none"> • 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

```

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
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
Domain
eline-svlans-vlan-1200 1200 10200  eline-bvlan   3150    M1,P2P
eline-svlans-vlan-2100 2100 10100  eline-bvlan   3150    M1,P2P

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
Domain
bd1           100      300      bd2            200      M1,MP
bd101         101      301      bd201          201      M1,MP

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
Domain
bd1           100      300      bd2            200      M1,MP

```

```

show l2-learning provider-instance instance logical-system
user@host> show l2-learning provider-instance logical-system all
PBN Routing Instance: vin1
Flags (P2P -ELINE service, MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
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, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
bd1           100      300      bd2           200      M1,MP

```

show l2-learning remote-backbone-edge-bridge

Syntax	<pre>show l2-learning remote-backbone-edge-bridge <remote-beb-mac-address> <instance [instance-name]> <logical-system [system-name all]></pre>
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	<p>remote-beb-mac-address—(Optional) Display information for a remote backbone edge bridge MAC address.</p> <p>instance instance-name—(Optional) Display information for a specified instance.</p> <p>logical-system [system-name all]—(Optional) Display information for a specified logical system or all systems.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • show l2-learning provider-instance on page 249 • Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers on page 17
List of Sample Output	<p>show l2-learning backbone-instance on page 253</p> <p>show l2-learning remote backbone edge bridge instance on page 253</p> <p>show l2-learning remote backbone edge bridge logical-system on page 253</p>
Output Fields	<p>Table 19 on page 252 describes the output fields for the show l2-learning instance command. Output fields are listed in the approximate order in which they appear.</p>

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: <ul style="list-style-type: none"> • 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

```

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
      Instance     Domain
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
      Instance     Domain
301      vin1      bd101        101     M1,MP  01:1e:86:00:01:2d

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      :
```

```

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 Address	Time before expiry (SS:MS)	Flags
00:aa:00:00:00:00	:	

CHAPTER 10

CoS Monitoring Commands

show class-of-service scheduler-map

Syntax	<code>show class-of-service scheduler-map</code> <code><name></code>
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 257
Output Fields	Table 20 on page 256 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

```

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	<code>show class-of-service traffic-control-profile</code> <code><profile-name></code>
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
Description	For Gigabit Ethernet IQ PICs, Channelized IQ PICs, EQ DPCs, and Trio MPC/MIC interfaces only, 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 259 show class-of-service traffic-control-profile (MX Series routers with Clear Channel Multi-Rate CE MIC) on page 260
Output Fields	Table 21 on page 258 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: <ul style="list-style-type: none"> cbr—Constant bit rate. rtvbr—Real time variable bit rate. nrtvbr—Non real time variable bit rate.
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.

Table 21: show class-of-service traffic-control-profile Output Fields (*continued*)

Field Name	Field Description
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: <ul style="list-style-type: none"> • 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.
Overhead accounting mode	Configured shaping mode, either 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
```

Sample Output

```
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
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
```

show firewall

Syntax	<pre>show firewall <filter <i>filter-name</i>> <counter <i>counter-name</i>> <log> <logical-system (all <i>logical-system-name</i>)> <terse></pre>
Syntax (EX Series Switches)	<pre>show firewall <filter <i>filter-name</i>> <counter <i>counter-name</i>></pre>
Release Information	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>logical-system option introduced in Junos OS Release 9.3.</p> <p>terse option introduced in Junos OS Release 9.4.</p>
Description	Display statistics about configured firewall filters.
Options	<p>none—(Optional) Display statistics about configured firewall filters.</p> <p>filter <i>filter-name</i>—(Optional) Name of a configured filter.</p> <p>counter <i>counter-name</i>—(Optional) Name of a filter counter.</p> <p>logical-system (all <i>logical-system-name</i>)—(Optional) Perform this operation on all logical systems or on a particular system.</p> <p>log—(Optional) Display log entries for firewall filters.</p> <p>terse—(Optional) Display firewall filter names only.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • clear firewall
List of Sample Output	<p>show firewall filter on page 263</p> <p>show firewall filter (Dynamic Input Filter) on page 263</p> <p>show firewall (Logical Systems) on page 263</p>
Output Fields	<p>Table 22 on page 262 lists the output fields for the show firewall command. Output fields are listed in the approximate order in which they appear.</p>

Table 22: show firewall Output Fields

Field Name	Field Description
Filter	<p>Name of a filter that has been configured with the filter statement at the [edit firewall] hierarchy level.</p> <p>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.</p> <p>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).</p>
Counters	<p>Display filter counter information:</p> <ul style="list-style-type: none"> • 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.
Policers	<p>Display policer information:</p> <ul style="list-style-type: none"> • Name—Name of policer. • Bytes—(I-chip DPCs only) 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. • 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.

Sample Output

```

show firewall filter      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      user@host> show firewall filter dfwd-ge-5/0/0.1-in
(Dynamic Input Filter)  Filter: dfwd-ge-5/0/0.1-in
Counters:
Name                               Bytes      Packets
c1-ge-5/0/0.1-in                  0           0

show firewall (Logical    user@host>show firewall
Systems)
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 interfaces interface-set queue

Syntax	show interfaces interface-set queue <i>interface-set-name</i> <aggregate remaining-traffic> <forwarding-class <i>class-name</i> >
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	<p><i>interface-set-name</i>—(Optional) Display information about the specified gigabit or 10-Gigabit Ethernet interface set. Wildcard values can be used in the interface set name.</p> <p>aggregate—(Optional) Display the aggregated queuing statistics of all member logical interfaces for interface sets that have traffic-control profiles configured.</p> <p>both-ingress-egress—(Optional) On Gigabit Ethernet Intelligent Queuing 2 (IQ2) PICs, display both ingress and egress queue statistics.</p> <p>egress—(Optional) Display egress queue statistics.</p> <p>forwarding-class <i>class-name</i>—(Optional) Display queuing statistics for the specified forwarding class.</p> <p>ingress—(Optional) On Gigabit Ethernet IQ2 PICs, display ingress queue statistics.</p> <p>remaining-traffic—(Optional) Display the queuing statistics of all member logical interfaces for interface sets that do not have traffic-control profiles configured.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • 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 265 show interfaces interface-set queue both-ingress-egress (Enhanced DPC) on page 266 show interfaces interface-set queue egress (Enhanced DPC) on page 268 show interfaces interface-set queue forwarding-class (Gigabit Ethernet) on page 269 show interfaces interface-set queue (Enhanced DPC) on page 270 show interfaces interface-set queue remaining-traffic (Gigabit Ethernet) on page 270
Output Fields	Table 23 on page 265 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. <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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 user@host> show interfaces interface-set queue ge-2/2/0-0
interface-set queue Interface set: ge-2/2/0-0
(Gigabit Ethernet)   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 :      0      0 pps
      Low        :      2921008      0 pps
      Medium-low :      0      0 pps
      Medium-high :      0      0 pps
      High        :      0      0 pps
    RED-dropped bytes :      0      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
both-ingress-egress
(Enhanced DPC)

```

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
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 :      0      0 pps
    RED-dropped bytes   :      0      0 bps
    RED-dropped bytes   :      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 :      0      0 pps
    RED-dropped bytes   :      0      0 bps
    RED-dropped bytes   :      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
egress (Enhanced
DPC)

```
user@host> show interfaces interface-set queue ge-2/2/0-0 egress
```

```
Interface set: ge-2/2/0-0
```

```
Interface set index: 3
```

```
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 user@host> show interfaces interface-set queue ge-2/2/0-0 forwarding-class best-effort
interface-set queue Interface set: ge-2/2/0-0
forwarding-class   Interface set index: 3
(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

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	<p>none—Display CoS associations for all logical interface sets.</p> <p>interface-set <i>interface-set-name</i>—(Optional) Display CoS associations for the specified interface set.</p>
Required Privilege Level	view
List of Sample Output	show class-of-service interface-set on page 275
Output Fields	Table 24 on page 274 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	<p>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.</p> <p>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).</p>
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	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 .

Sample Output

```

show class-of-service user@host> show class-of-service interface-set example-ifset-ge-4/0/0-7
interface-set          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

```

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	<p>Command introduced in Junos OS Release 8.4.</p> <p>Support for ITU-T Y.1731 frame delay measurement added in Junos OS Release 9.5.</p>
Description	<p>On M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M320, MX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for Ethernet interfaces.</p> <p>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.</p>
Options	<p>brief detail extensive—(Optional) Specified level of output.</p> <p>ethernet-interface-name—(Optional) CFM information only for CFM entities attached to the specified Ethernet interface.</p> <p>level md-level—(Optional) CFM information for CFM identities enclosed within a maintenance domain of the specified level.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> 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 285 show oam ethernet connectivity-fault-management mep-statistics
List of Sample Output	<p>show oam ethernet connectivity-fault-management interfaces on page 280</p> <p>show oam ethernet connectivity-fault-management interfaces detail on page 281</p> <p>show oam ethernet connectivity-fault-management interfaces detail (One-Way ETH-DM) on page 281</p> <p>show oam ethernet connectivity-fault-management interfaces detail (Connection Protection TLV Configured) on page 282</p> <p>show oam ethernet connectivity-fault-management interfaces extensive on page 283</p> <p>show oam ethernet connectivity-fault-management interfaces level on page 283</p> <p>show oam ethernet connectivity-fault-management interfaces (trunk ports) on page 284</p>
Output Fields	<p>Table 25 on page 277 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.</p>

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
Neighbours	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	<p>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.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Valid 1DMs received	<p>If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of valid 1DM frames received.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Invalid 1DMs received	<p>If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of invalid 1DM frames received.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Out of sync 1DMs received	<p>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.</p>	detail extensive
DMMs sent	<p>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.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Valid DMMs received	<p>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.</p>	detail extensive
Invalid DMMs received	<p>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.</p>	detail extensive
DMRs sent	<p>If the interface is attached to a responder MEP for a two-way ETH-DM session: Number of delay measurement reply (DMR) frames sent.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Valid DMRs received	<p>If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of valid DMRs received.</p> <p>For all other cases, this field displays 0.</p>	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      Neighbours
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@hostshow 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
  LTRs 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 Identifier  Neighbours
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	Identifier	Neighbours
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	Identifier	Neighbours
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	Identifier	Neighbours
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	Identifier	Neighbours
ge-10/3/10.4091, vlan 4091	Down	Inactive	4	400	0	

show oam ethernet connectivity-fault-management mep-database

Syntax	<pre>show oam ethernet connectivity-fault-management mep-database maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> <local-mep <i>local-mep-id</i>> <remote-mep <i>remote-mep-id</i>></pre>
Release Information	<p>Command introduced in Junos OS Release 8.4.</p> <p>Support for ITU-T Y.1731 frame delay measurement added in Junos OS Release 9.5.</p>
Description	<p>On M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M320, M120, MX 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.</p> <p>In addition, on M120, M320, and MX series routers, also display port status TLV, interface status TLV, and action profile information.</p> <p>In addition, for Ethernet interfaces on MX Series routers, also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts.</p>
Options	<p>maintenance-association <i>ma-name</i>—Name of the maintenance association.</p> <p>maintenance-domain <i>domain-name</i>—Name of the maintenance domain.</p> <p><i>local-mep-id</i>—(Optional) Numeric identifier of local MEP.</p> <p><i>remote-mep-id</i>—(Optional) Numeric identifier of the remote MEP.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> clear oam ethernet connectivity-fault-management statistics show oam ethernet connectivity-fault-management delay-statistics show oam ethernet connectivity-fault-management interfaces on page 276 show oam ethernet connectivity-fault-management mep-statistics
List of Sample Output	<p>show oam ethernet connectivity-fault-management mep-database on page 290</p> <p>show oam ethernet connectivity-fault-management mep-database (One-Way ETH-DM) on page 291</p> <p>show oam ethernet connectivity-fault-management mep-database local-mep remote-mep on page 291</p> <p>show oam ethernet connectivity-fault-management mep-database remote-mep (Action Profile Event) on page 292</p> <p>show oam ethernet connectivity-fault-management mep-database (Connection Protection TLV Configured) on page 292</p> <p>show oam ethernet connectivity-fault-management mep-database on page 293</p>

[show oam ethernet connectivity-fault-management mep-database \(enhanced continuity measurement\) on page 293](#)

Output Fields Table 26 on page 286 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	<ul style="list-style-type: none"> 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. <p>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.</p>
Interface status TLV	<ul style="list-style-type: none"> 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. <p>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.</p>
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)

show oam ethernet connectivity-fault-management mep-database
(Connection Protection TLV Configured)
user@host>show oam ethernet connectivity-fault-management mep-database
maintenance-domain md5 maintenance-association ma5
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
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

```

(enhanced continuity
measurement) 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 295 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

```

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 (<i>mac-address</i> <i>mep-id</i>) maintenance-association <i>ma-name</i> maintenance-domain <i>md-name</i> ttl <i>value</i> <wait seconds>
Release Information	Command introduced in Junos OS Release 9.0. mep-id option introduced in Junos OS Release 9.1.
Description	<p>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.</p> <p>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.</p>
Options	<p>mac-address—Destination unicast MAC address of the remote maintenance point.</p> <p>mep-id—MEP identifier of the remote maintenance point. The range of values is 1 through 8191.</p> <p>maintenance-association <i>ma-name</i>—Specifies an existing maintenance association from the set of configured maintenance associations.</p> <p>maintenance-domain <i>md-name</i>—Specifies an existing maintenance domain from the set of configured maintenance domains.</p> <p>ttl value—Number of hops to use in the linktrace request. The range is 1 to 255 hops. The default is 4.</p> <p>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.</p>
Required Privilege Level	network
List of Sample Output	traceroute ethernet on page 297
Output Fields	<p>Table 28 on page 296 lists the output fields for the traceroute ethernet command. Output fields are listed in the approximate order in which they appear.</p>

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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