



Junos[®] OS for EX Series Ethernet Switches

Spanning-Tree Protocols for EX9200 Switches

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Release 12.3
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Documentation and Release Notes

To obtain the most current version of all Juniper Networks[®] technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Supported Platforms

For the features described in this document, the following platforms are supported:

- EX Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the CLI User Guide.

Documentation Conventions

Table 1 on page xiii defines notice icons used in this guide.

Table 1: Notice Icons


Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page xiii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric metric>;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast <i>(string1 string2 string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [community-ids]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
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- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:
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- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [Spanning-Tree on page 3](#)

CHAPTER 1

Spanning-Tree

- [Spanning-Tree Protocols Supported on page 4](#)
- [BPDU Overview on page 5](#)
- [Loop Protection for Spanning-Tree Instance Interfaces Overview on page 6](#)
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- [VPLS Multihoming: System Identifier for Bridges in the Ring on page 22](#)
- [VPLS Multihoming: Bridge Flush of MAC Cache on Topology Change on page 23](#)

Spanning-Tree Protocols Supported

In a Layer 2 environment, you can configure various spanning-tree protocol versions to create a loop-free topology in Layer 2 networks.

A spanning-tree protocol is a Layer 2 control protocol (L2CP) that calculates the best path through a switched network containing redundant paths. A spanning-tree protocol uses bridge protocol data unit (BPDU) data frames to exchange information with other switches. A spanning-tree protocol uses the information provided by the BPDUs to elect a root bridge, identify root ports for each switch, identify designated ports for each physical LAN segment, and prune specific redundant links to create a loop-free tree topology. The resulting tree topology provides a single active Layer 2 data path between any two end stations.



NOTE: In discussions of spanning-tree protocols, the terms *bridge* and *switch* are often used interchangeably.

The Juniper Networks MX Series 3D Universal Edge Routers and EX Series switches support STP, RSTP, MSTP, and VSTP.

- The original Spanning-Tree Protocol (STP) is defined in the IEEE 802.1D 1998 specification. A newer version called Rapid Spanning-Tree Protocol (RSTP) was originally defined in the IEEE 802.1w draft specification and later incorporated into the IEEE 802.1D-2004 specification. A recent version called Multiple Spanning-Tree Protocol (MSTP) was originally defined in the IEEE 802.1s draft specification and later incorporated into the IEEE 802.1Q-2003 specification. The VLAN Spanning-Tree Protocol (VSTP) is compatible with the Per-VLAN Spanning Tree Plus (PVST+) and Rapid-PVST+ protocols supported on Cisco Systems routers and switches.
- RSTP provides faster reconvergence time than the original STP by identifying certain links as point to point and by using protocol handshake messages rather than fixed timeouts. When a point-to-point link fails, the alternate link can transition to the forwarding state without waiting for any protocol timers to expire.
- MSTP provides the capability to logically divide a Layer 2 network into regions. Every region has a unique identifier and can contain multiple instances of spanning trees. All regions are bound together using a Common Instance Spanning Tree (CIST), which is responsible for creating a loop-free topology *across* regions, whereas the Multiple Spanning-Tree Instance (MSTI) controls topology *within* regions. MSTP uses RSTP as a converging algorithm and is fully interoperable with earlier versions of STP.
- VSTP maintains a separate spanning-tree instance for each VLAN. Different VLANs can use different spanning-tree paths. When different VLANs use different spanning-tree paths, the CPU processing resources being consumed increase as more VLANs are configured. VSTP BPDU packets are tagged with the corresponding VLAN identifier and are transmitted to the multicast destination media access control (MAC)

address **01-00-0c-cc-cc-cd** with a protocol type of **0x010b**. VSTP BPDUs are tunneled by pure IEEE 802.1q bridges.



NOTE: All virtual switch routing instances configured on an MX Series router are supported using only one spanning-tree process. The Layer 2 control protocol process is named **l2cpd**.

For more information about the various versions of spanning-tree protocols, see the appropriate IEEE specification.

Related Documentation

- [Loop Protection for Spanning-Tree Instance Interfaces Overview on page 6](#)
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)

BPDU Overview

In a Layer 2 bridge environment, spanning-tree protocols use data frames called Bridge Protocol Data Units (BPDUs) to exchange information among bridges.

Spanning-tree protocols on peer systems exchange BPDUs, which contain information about port roles, bridge IDs, and root path costs. On each MX Series router or EX Series switch, the spanning-tree protocol uses this information to elect a root bridge, identify root ports for each switch, identify designated ports for each physical LAN segment, and prune specific redundant links to create a loop-free tree topology. The resulting tree topology provides a single active Layer 2 data path between any two end stations.



NOTE: In discussions of spanning-tree protocols, the terms *bridge* and *switch* are often used interchangeably.

The transmission of BPDUs is controlled by the Layer 2 Control Protocol process (l2cpd) on MX Series 3D Universal Edge Routers.

The transmission of periodic packets on behalf of the l2cpd process is carried out by periodic packet management (PPM), which, by default, is configured to run on the Packet Forwarding Engine. The pppmd process on the Packet Forwarding Engine ensures that the BPDUs are transmitted even when the l2cpd process control plane is unavailable, and keeps the remote adjacencies alive during a unified in-service software upgrade (unified ISSU). However, if you want the distributed PPM (ppmd) process to run on the Routing Engine instead of the Packet Forwarding Engine, you can disable the pppmd process on the Packet Forwarding Engine. For more information, see the Junos OS High Availability Configuration Guide.

On MX Series routers or EX Series switches with redundant Routing Engines (two Routing Engines that are installed in the same router), you can configure nonstop bridging. Nonstop

bridging enables the router to switch from a primary Routing Engine to a backup Routing Engine without losing Layer 2 Control Protocol (L2CP) information. Nonstop bridging uses the same infrastructure as graceful Routing Engine switchover (GRES) to preserve interface and kernel information. However, nonstop bridging also saves L2CP information by running the l2cpd process on the backup Routing Engine.



NOTE: To use nonstop bridging, you must first enable GRES.

Nonstop bridging is supported for the following Layer 2 control protocols:

- Spanning-Tree Protocol (STP)
- Rapid Spanning-Tree Protocol (RSTP)
- Multiple Spanning-Tree Protocol (MSTP)

For more information about GRES and nonstop bridging, see the Junos OS High Availability Configuration Guide.

**Related
Documentation**

- [Spanning-Tree Protocols Supported on page 4](#)
- [Loop Protection for Spanning-Tree Instance Interfaces Overview on page 6](#)
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)

Loop Protection for Spanning-Tree Instance Interfaces Overview

Spanning-tree protocol loop protection enhances the normal checks that spanning-tree protocols perform on interfaces. Loop protection performs a specified action when BPDUs are not received on a nondesignated port interface. You can choose to block the interface or issue an alarm when bridge protocol data units (BPDUs) are not received on the port.

The spanning-tree protocol family is responsible for breaking loops in a network of bridges with redundant links. However, hardware failures can create forwarding loops (STP loops) and cause major network outages. Spanning-tree protocols break loops by blocking ports (interfaces). However, errors occur when a blocked port transitions erroneously to a forwarding state.

Ideally, a spanning-tree protocol bridge port remains blocked as long as a superior alternate path to the root bridge exists for a connected LAN segment. This designated port is determined by receiving superior BPDUs from a peer on that port. When other ports no longer receive BPDUs, the spanning-tree protocol considers the topology to be loop free. However, if a blocked or alternate port moves into a forwarding state, this creates a loop.

By default (that is, without spanning-tree protocol loop protection configured), an interface that stops receiving BPDUs will assume the designated port role and possibly result in a spanning-tree protocol loop.

You can configure spanning-tree protocol loop protection to improve the stability of Layer 2 networks.

You configure spanning-tree protocol loop protection to prevent selected interfaces from interpreting the lack of received BPDUs as a “false positive” condition for making the interface the designated port.

- Related Documentation**
- [Loop Protection for a Spanning-Tree Instance Interface on page 19](#)
 - [Configuring Loop Protection for a Spanning-Tree Instance Interface on page 59](#)
 - [Example: Enabling Loop Protection for Spanning-Tree Protocols on page 27](#)

Root Protection for Spanning-Tree Instance Interfaces Overview

Root protect helps to enforce the root bridge placement in a Layer 2 switched network. Enable root protect on interfaces that should not receive superior bridge protocol data units (BPDUs) from the root bridge. Typically, these ports are Spanning-Tree-Protocol-designated ports on an administrative boundary. Enabling root protect ensures the port remains a spanning-tree designated port.

If the bridge receives superior BPDUs on a port that has root protect enabled, that port transitions to a root-prevented STP state and the interface is blocked. This prevents a bridge that should not be the root bridge from being elected the root bridge.

After the bridge stops receiving superior BPDUs on the port with root protect enabled and the received BPDUs time out, that port transitions back to the STP-designated port state.

- Related Documentation**
- [Root Protect for a Spanning-Tree Instance Interface on page 19](#)
 - [Enabling Root Protect for a Spanning-Tree Instance Interface on page 60](#)

BPDU Protection for Spanning-Tree Instance Interfaces Overview

By default, if a Bridge Protocol Data Unit (BPDU) data frame is received on a blocked interface, the system will disable the interface and stop forwarding frames out the interface until the interface is explicitly cleared.

The Spanning-Tree Protocol (STP) family is designed to break possible loops in a Layer 2 bridged network. Loop prevention avoids damaging broadcast storms that can potentially render the network useless. STP processes on bridges exchange BPDUs to determine the LAN topology, decide the root bridge, stop forwarding on some ports, and so on. However, a misbehaving user application or device can interfere with the operation of the STP protocols and cause network problems.

On the MX Series routers or EX Series switches only, you can configure BPDU protection to ignore BPDUs received on interfaces where none should be expected (for example, a LAN interface on a network edge with no other bridges present). If a BPDU is received on a blocked interface, the interface is disabled and stops forwarding frames. By default, all BPDUs are accepted and processed on all interfaces.

You can configure BPDU protection on interfaces with the following encapsulation types:

- **ethernet-bridge**
- **ethernet-vpls**
- **extended-vlan-bridge**
- **vlan-vpls**
- **extended-vlan-vpls**

You can configure BPDU protection on individual interfaces or on all the edge ports of the bridge.

**Related
Documentation**

- [Configuring BPDU Protection on Individual Interfaces on page 61](#)
- [Configuring BPDU Protection on All Edge Ports on page 62](#)
- [Spanning-Tree Protocols Supported on page 4](#)
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)

VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview

Redundancy is built into many networks through the use of alternate links and paths, which often take the shape of rings.

In the case of multiple hosts attached to customer edge (CE) routers and provider edge (PE) routers to secure virtual private LAN service (VPLS), this practice is often called *multihoming*:

- Multiple hosts attach to CE routers, which are attached to each other as well as to the PE routers that access the VPLS network cloud. Any single link between the edge routers can fail without impacting the hosts' access to the VPLS services.
- This Layer 2 ring connects to the multiprotocol link switching (MPLS) infrastructure through two PE routers. Link breaks on the ring are protected by running a version of the spanning-tree protocol with the root-protect option enabled.

The virtual private network (VPN) protocols at Layer 3, however, are not aware of the blocking state that results from this root protection setup (rings or loops are not permitted at Layer 2 because the Layer 2 protocols will not function properly).

However, to keep the Layer 2 ring functioning in a multihomed environment with link failures, the spanning-tree protocol running on the MX Series routers requires the following additional configuration:

- The VPN protocols have to act on the blocking and unblocking of interfaces by the spanning-tree protocol. Specifically, media access control (MAC) flush messages need to be sent by the blocking PE router to LDP peers in order to flush the MAC addresses learned when other interface ports were blocked.

- Also, if an active PE router with VPLS root protection bridging enabled loses VPLS connectivity, root protection requires that the bridge switch to the other PE router to maintain connectivity. The spanning-tree protocol needs to be aware of the status of the VPLS connectivity on the PE router. If the MAC address cache is not flushed when the topology changes, frames could be sent to the wrong device.

You can control the actions taken by the MX Series router when the topology changes in a multihomed Layer 2 ring VPLS environment using *VPLS root protection*.

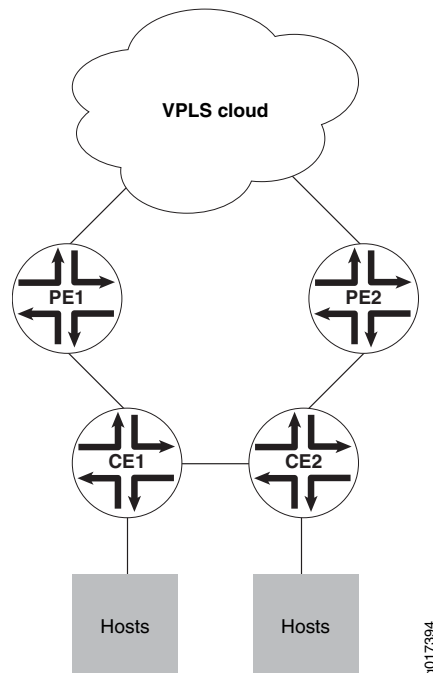
Related Documentation

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology on page 9](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior on page 62](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology

Figure 1 on page 9 shows hosts connected to CE routers and to a VPLS network through two PE routers. The CE routers are also connected, forming a kind of ring structure.

Figure 1: VPLS Multihoming Configuration



The two PE routers have their own links to a VPLS network service, but are not directly connected to each other. All four edge routers run some type of spanning-tree protocol with root protection enabled, and only one PE interface will be in the forwarding state, the other being blocked.

Assume this forwarding interface is through PE1. If the link between CE1 and CE2 fails, then the blocking PE2 interface must detect a root protection switch and move to the forwarding state. All of the MAC addresses learned by CE2 that connect to the VPLS network service through PE1 need to be flushed. In the same way, when the link between CE1 and CE2 is restored, PE2 again detects the root protection switch and begins blocking again. Now all of the MAC addresses learned by CE2 that connect through PE2 need to be flushed. All of this is controlled by configuring VPLS root protection topology change actions on the CE routers.

Also, at a global level, each type of spanning-tree protocol will have a priority hold time associated with it. This is the number of seconds in the range from 1 through 255 seconds that the system waits to switch to the primary priority when the first core domain comes up. The default is 2 seconds. This allows the maximum number of core domains to come up, and some might be slower than others.

**Related
Documentation**

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior on page 62](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

Layer 2 Protocol Tunneling Through a Network Overview

Layer 2 protocol tunneling allows Layer 2 protocol data units (PDUs) to be tunneled through a network. This is useful to provide a single spanning-tree protocol domain for subscribers across a service provider network. It is also useful for tunneling Cisco Discovery Protocol (CDP) or VLAN Trunk Protocol (VTP) PDUs across a network.

Layer 2 protocol tunneling is supported on MX Series routers with Enhanced (Dense Port Concentrators) DPCs and Enhanced Queuing (DPCs), see [Table 4 on page 11](#) for a list of the DPCs supported. Layer 2 protocol tunneling is supported on all Modular Port Concentrators (MPCs),



NOTE: Layer 2 protocol tunneling is not supported on Rev-A DPCs on MX Series routers because of microcode space limitations.

When a control packet for STP, CDP, or VTP is received on a service provider edge port configured for Layer 2 protocol tunneling, the multicast destination MAC address is rewritten with the predefined multicast tunnel MAC address of **01:00:0c:cd:cd:d0**. The packet is transported across the provider network transparently to the other end of the tunnel and the original multicast destination MAC address is restored when the packet is transmitted.

If a packet is received on a tunnel interface that already has a destination multicast MAC address of **01:00:0c:cd:cd:d0**, the port enters an error state and is shut down. To clear

the error condition, the administrator must enter the **clear error mac-rewrite interface *interface-name*** command.

Layer 2 protocol tunneling and MAC rewrite are supported in VPLS, but only certain hardware configurations are supported.

[Table 3 on page 11](#) shows the MPCs and Enhanced DPCs supported when configuring Layer 2 protocol tunneling and VPLS.

Table 3: MAC Rewrite and VPLS Configurations

CE-Facing Interface	PE-Core Facing Interface	Layer 2 Protocol Tunneling
MPC	MPC	Yes
MPC	Enhanced DPC	Yes
Enhanced DPC	MPC	Yes
Enhanced DPC	Enhanced DPC	No

[Table 4 on page 11](#) lists the DPCs that support the Layer 2 tunneling protocol.

Table 4: DPCs Supported for Layer 2 Protocol Tunneling

DPC Name	DPC Model Number
Gigabit Ethernet	
Gigabit Ethernet Enhanced DPC with SFP	DPCE-R-40GE-SFP
Gigabit Ethernet Enhanced Ethernet Services DPC with SFP	DPCE-X-40GE-SFP
Gigabit Ethernet Enhanced Queuing Ethernet Services DPC with SFP	DPCE-X-Q-40GE-SFP
Gigabit Ethernet Enhanced Queuing IP Services DPCs with SFP	DPCE-R-Q-20GE-SFP
Gigabit Ethernet Enhanced Queuing IP Services DPCs with SFP	DPCE-R-Q-40GE-SFP
10-Gigabit Ethernet	
10-Gigabit Ethernet Enhanced DPCs with XFP	DPCE-R-2XGE-XFP
10-Gigabit Ethernet Enhanced DPCs with XFP	DPCE-R-4XGE-XFP
10-Gigabit Ethernet Enhanced Ethernet Services DPC with XFP	DPCE-X-4XGE-XFP

Table 4: DPCs Supported for Layer 2 Protocol Tunneling (*continued*)

DPC Name	DPC Model Number
10-Gigabit Ethernet Enhanced Queuing Ethernet Services DPC with XFP	DPCE-X-Q-4XGE-XFP
10-Gigabit Ethernet Enhanced Queuing IP Services DPC with XFP	DPCE-R-Q-4XGE-XFP
Multi-Rate Ethernet	
Multi-Rate Ethernet Enhanced DPC with SFP and XFP	DPCE-R-20GE-2XGE
Multi-Rate Ethernet Enhanced Ethernet Services DPC with SFP and XFP	DPCE-X-20GE-2XGE
Multi-Rate Ethernet Enhanced Queuing IP Services DPC with SFP and XFP	DPCE-R-Q-20GE-2XGE
Tri-Rate Ethernet	
Tri-Rate Enhanced DPC	DPCE-R-40GE-TX
Tri-Rate Enhanced Ethernet Services DPC	DPCE-X-40GE-TX



NOTE: When an MX Series router or EX Series switch sends a RADIUS access request, the Chargeable-User-Identity parameter is sent with an empty field. For more information about configuring RADIUS, see the *Junos Subscriber Access Configuration Guide*.

Related Documentation

- [Configuring Layer 2 Protocol Tunneling on page 64](#)
- [Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 106](#)
- [Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 107](#)

Spanning-Tree Protocols in Logical Systems

On MX Series routers and EX Series switches only, you can configure spanning-tree protocols in logical systems for bridge domains and other virtual-switch routing instances.

When configuring spanning-tree protocols in logical systems for bridge domains and other virtual-switch routing instances, the following guidelines apply:

- You can only configure 16 logical systems.
- Logging is performed for the entire device and not per logical system.

- You cannot restart Layer 2 learning for an individual logical system.

**Related
Documentation**

- [Spanning-Tree Protocols Supported on page 4](#)

Bridge Priority for Election of Root Bridge and Designated Bridge

Use the bridge priority to control which bridge is elected as the root bridge and also to control which bridge is elected the root bridge when the initial root bridge fails.

The root bridge for each spanning-tree protocol instance is determined by the bridge ID. The bridge ID consists of a configurable bridge priority and the MAC address of the bridge. The bridge with the lowest bridge ID is elected as the root bridge. If the bridge priorities are equal or if the bridge priority is not configured, the bridge with the lowest MAC address is elected the root bridge.

The bridge priority can also be used to determine which bridge becomes the designated bridge for a LAN segment. If two bridges have the same path cost to the root bridge, the bridge with the lowest bridge ID becomes the designated bridge.

The bridge priority can be set only in increments of 4096.

**Related
Documentation**

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- `bridge-priority`

Maximum Age for Awaiting Arrival of Hello BPDUs

The maximum age timer specifies the maximum expected arrival time of hello BPDUs. If the maximum age timer expires, the bridge detects that the link to the root bridge has failed and initiates a topology reconvergence. The maximum age timer should be longer than the configured hello timer.

**Related
Documentation**

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [max-age on page 78](#)

Hello Time for Root Bridge to Transmit Hello BPDUs

The hello timer specifies the time interval at which the root bridge transmits configuration BPDUs.

**Related
Documentation**

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)

- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [hello-time on page 76](#)

Forward Delay Before Ports Transition to Forwarding State

The forwarding delay timer specifies the length of time a spanning-tree protocol bridge port remains in the listening and learning states before transitioning to the forwarding state. Setting the interval too short could cause unnecessary spanning-tree reconvergence. Before changing this parameter, you should have a thorough understanding of spanning-tree protocols.

Related Documentation

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [forward-delay on page 75](#)

Spanning-Tree Instance Interface

STP and RSTP are limited to a single instance on any physical interface. Use the **interface** statement to configure which interfaces participate in the STP or RSTP instance.

MSTP supports multiple instances on a single physical interface. Use the **interface** statement to configure which logical interfaces participate in MSTP.

For VSTP, interfaces can be configured at the global level or at the VLAN level. Interfaces configured at the global VSTP level will be enabled for all the configured VLANs. If an interface is configured at both the global and VLAN levels, the configuration at the VLAN level overrides the global configuration.

Related Documentation

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [cost on page 71](#)
- [edge on page 73](#)
- [interface \(Spanning Tree\) on page 77](#)
- [mode on page 80](#)
- [priority on page 83](#)

Spanning-Tree Instance Interface Priority

The root port is the interface on the nonroot bridge with the lowest path cost to the root bridge. When multiple interfaces have the same path cost to the root bridge, the interface with the lowest interface priority is selected as the root port.

If the interface priority is not configured and multiple interfaces have the same path cost to the root bridge, the interface with the lowest interface identifier is selected as the root port.

If the interface priority is configured under the MSTP protocol, this becomes the default value for all interfaces. If the interface priority is configured under the MSTI interface, the value overrides the default for that interface.

If the interface priority is configured at both the VSTP global and VLAN levels, the configuration at the VLAN level overrides the global configuration.

Related Documentation

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [interface \(Spanning Tree\) on page 77](#)
- [priority on page 83](#)

Spanning-Tree Instance Interface Cost

The path cost used to calculate the root path cost from any given LAN segment is determined by the total cost of each link in the path. By default, the link cost is determined by the speed of the link. The interface cost can be configured to override the default cost and control which bridge is the designated bridge and which port is the designated port. In MSTP the CIST external path cost is determined by the link speed and the number of hops.

If the interface cost is not configured, the cost is determined by the speed of the interface. For example, a 100-Mbps link has a default path cost of 19, a 1000-Mbps link has a default path cost of 4, and a 10-Gbps link has a default path cost of 2.

If the interface cost is configured under MSTP, this becomes the default value for all interfaces. If the interface cost is configured under the MSTI interface, the value overrides the default for that interface.

If the interface cost is configured at both the VSTP global and VLAN levels, the configuration at the VLAN level overrides the global configuration.

The interface cost should be set the same for all interfaces connected to the same LAN segment.

Related Documentation

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)

- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [cost on page 71](#)
- [interface \(Spanning Tree\) on page 77](#)

Spanning-Tree Instance Interface Point-to-Point Link Mode

The interface mode allows RSTP, MSTP, and VSTP to converge faster than the original STP on point-to-point links. The protocol does not need to wait for timers on point-to-point links. Configure interfaces that have a point-to-point link to another Layer 2 bridge as **p2p**. This parameter is ignored if the STP is configured to run the original spanning-tree version.

If the interface mode is configured at both the VSTP global and VLAN levels, the configuration at the VLAN level overrides the global configuration.

Related Documentation

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [mode on page 80](#)
- [interface \(Spanning Tree\) on page 77](#)

Spanning-Tree Instance Interface Configured as an Edge Port

RSTP, MSTP, and VSTP instance interfaces configured as *edge ports* enable the protocol to converge faster than the original IEEE 802.1D STP version. Edge ports transition directly to the forwarding state, and so the protocol does not need to wait for BPDUs to be received on edge ports.

The Junos OS supports automatic detection of edge ports as described in the RSTP standard. Layer 2 bridges do not expect to receive BPDUs for edge ports. If a BPDU is received for an edge port, the port becomes a non-edge port.

Keep the following guidelines in mind when configuring spanning-tree instance interfaces as edge ports:

- Do not configure a spanning-tree instance interface as an edge port if it is connected to any Layer 2 bridge. An instance interface connected to Layer 2 bridges but configured as an edge port can cause physical loops.
- If the spanning-tree protocol is configured to run the original IEEE 802.1D spanning-tree version, the edge-port option (if configured) is ignored.
- If edge ports are configured at both the VSTP global and VLAN levels, the configuration at the VLAN level overrides the global configuration.

- Related Documentation**
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
 - [Configuring Multiple Spanning-Tree Protocol on page 44](#)
 - [Configuring VLAN Spanning-Tree Protocol on page 54](#)
 - [edge on page 73](#)
 - [interface \(Spanning Tree\) on page 77](#)

Spanning-Tree Protocol Trace Options

In order to trace spanning-tree protocol operations, you can set spanning-tree protocol-specific trace options in the spanning-tree protocol configuration.

For general information about tracing and global tracing options, see the statement summary for the global **traceoptions** statement in the Junos OS Routing Protocols Configuration Guide.

- Related Documentation**
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
 - [Configuring Multiple Spanning-Tree Protocol on page 44](#)
 - [Configuring VLAN Spanning-Tree Protocol on page 54](#)
 - [Example: Tracing Spanning-Tree Protocol Operations on page 40](#)
 - [traceoptions \(Spanning Tree\) on page 86](#)

MAC Address Rewriting Enabled for Layer 2 Protocol Tunneling

To configure Layer 2 protocol tunneling, you must enable MAC address rewriting by installing the destination multicast tunnel MAC address of **01:00:0c:cd:cd:d0** in the MAC table.

To enable MAC address rewriting, include the **mac-rewrite** statement at the **[edit protocols layer2-control]** hierarchy level.

When enabling MAC address rewriting for Layer 2 protocol tunneling, the following guidelines apply:

- You can enable Layer 2 protocol tunneling for untagged interfaces.
- You can enable Layer 2 protocol tunneling for single-identifier tagged ports.
- You cannot enable Layer 2 protocol tunneling for double identifier tagged interfaces

- Related Documentation**
- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
 - [Layer 2 Protocol Tunnel Interface on page 18](#)
 - [Layer 2 Protocol to be Tunneled on page 18](#)
 - [Configuring Layer 2 Protocol Tunneling on page 64](#)

Layer 2 Protocol Tunnel Interface

To configure the interface where Layer 2 protocol tunneling is enabled, include the **interface** *ge-fpc/pic/port* statement at the **[edit protocols layer2-control]** hierarchy level.

Keep the following guidelines in mind when configuring Layer 2 protocol tunneling:

- Layer 2 protocol tunneling is supported on MX Series routers with enhanced queuing Dense Port Concentrators (DPCs).
- Layer 2 protocol tunneling must be configured on the interfaces at each end of the tunnel.
- You can enable Layer 2 protocol tunneling for untagged interfaces and single-identifier tagged interfaces only.
- For single-identifier tagged ports, configure a logical interface with the native VLAN identifier. This configuration associates the untagged control packets with a logical interface.
- You cannot enable Layer 2 protocol tunneling for double identifier tagged interfaces.

Related Documentation

- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
- [MAC Address Rewriting Enabled for Layer 2 Protocol Tunneling on page 17](#)
- [Layer 2 Protocol to be Tunneled on page 18](#)
- [Configuring Layer 2 Protocol Tunneling on page 64](#)

Layer 2 Protocol to be Tunneled

To configure Layer 2 protocol tunneling, you must specify the protocol that is to be tunneled using the Layer 2 tunnel:

- **cdp**—Cisco Discovery Protocol.
- **stp**—All versions of the spanning-tree protocol.
- **vtp**—Tunnel the VLAN trunk protocol.

For each protocol specified, a static destination MAC address corresponding to the protocol being tunneled is installed in the MAC table.

To specify the protocol that will be tunneled by the Layer 2 protocol tunneling, you can include the **protocol** (**cdp | stp | vtp**) statement at the **[edit protocols layer2-control mac-rewrite interface ge-fpc/pic/port]** hierarchy level.



NOTE: When CDP, STP, or VTP is configured for tunneling on a customer-facing port in a provider bridge, the corresponding protocol should not be enabled for operation on that interface.

- Related Documentation**
- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
 - [MAC Address Rewriting Enabled for Layer 2 Protocol Tunneling on page 17](#)
 - [Layer 2 Protocol Tunnel Interface on page 18](#)
 - [Configuring Layer 2 Protocol Tunneling on page 64](#)

Loop Protection for a Spanning-Tree Instance Interface

By default, a spanning-tree protocol interface that stops receiving Bridge Protocol Data Unit (BPDU) data frames will transition to the designated port (forwarding) state, creating a potential loop. To prevent a spanning-tree instance interface from interpreting a lack of received BPDUs as a “false positive” condition for assuming the designated port role, you can configure one of the following loop protection options:

- Configure the router to raise an alarm condition if the spanning-tree instance interface has not received BPDUs during the timeout interval.
- Configure the router to block the spanning-tree instance interface if the interface has not received BPDUs during the timeout interval.



NOTE: Spanning-tree instance interface loop protection is enabled for all spanning-tree instances on the interface, but blocks or alarms only those instances that stop receiving BPDUs.

We recommend you configure loop protection only on non-designated interfaces such as the root or alternate interfaces. Otherwise, if you configure loop protection on both sides of a designated link, then certain STP configuration events (such as setting the root bridge priority to an inferior value in a topology with many loops) can cause both interfaces to transition to blocking mode.

- Related Documentation**
- [Loop Protection for Spanning-Tree Instance Interfaces Overview on page 6](#)
 - [Configuring Loop Protection for a Spanning-Tree Instance Interface on page 59](#)
 - [Example: Enabling Loop Protection for Spanning-Tree Protocols on page 27](#)
 - `bpdutimeout-action`
 - [interface \(Spanning Tree\) on page 77](#)

Root Protect for a Spanning-Tree Instance Interface

When root protect is enabled on an interface, it is enabled for all spanning-tree protocol instances on that interface. The interface is blocked only for those instances that receive superior BPDUs.

By default, root protect is disabled.

- Related Documentation**
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [Enabling Root Protect for a Spanning-Tree Instance Interface on page 60](#)
 - [interface \(Spanning Tree\) on page 77](#)
 - [no-root-port on page 96](#)

BPDU Protection for Individual Spanning-Tree Instance Interfaces

To configure BPDU protection on one or more spanning-tree instance interfaces, include the **bpdu-block** statement:

```
bpdu-block {  
  interface interface-name;  
  disable-timeout seconds;  
}
```



NOTE: If you also include the optional **disable-timeout *seconds*** statement, *blocked interfaces* are automatically cleared after the specified time interval unless the interval is 0.

- Related Documentation**
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [Configuring BPDU Protection on Individual Interfaces on page 61](#)

BPDU Protection on All Edge Ports of the Bridge

To configure edge port blocking for a particular STP family member, include the **bpdu-block-on-edge** statement for **mstp**, **rstp**, or **vstp**:

```
bpdu-block-on-edge;  
interface interface-name;
```



NOTE: In contrast to BPDU protection configured on individual spanning-tree instance interfaces, BPDU protection configured on all edge ports of an entire spanning-tree protocol *disables designated edge ports* and does not enable them again.

- Related Documentation**
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [Configuring BPDU Protection on All Edge Ports on page 62](#)

VPLS Multihoming: Priority of the Backup Bridge

When an MX Series router in a VPLS multihomed Layer 2 ring is running a spanning-tree protocol with root protection enabled, you can modify the default actions taken by the MX Series router when the topology changes. To do this, configure the VPLS root protection topology change actions.

The default value of the backup bridge is **32,768**. You can set the backup bridge priority to a value from **0** through **61440**, in increments of 4096.

To change the default value, you can use the following statement:

backup-bridge-priority vpls-ring-backup-bridge-priority

You can include the statement at the **[edit protocols (mstp | rstp | vstp)]** hierarchy level (to control global spanning-tree protocol behavior) or at the **[edit protocols vstp vlan vlan-id]** hierarchy level (to control a particular VLAN).



NOTE: VPLS root topology change actions are configured independently of VPLS, the spanning-tree protocol, or the spanning-tree protocol root protect option.

Related Documentation

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihoming: Hold Time Before Switching to Primary Priority on page 21](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

VPLS Multihoming: Hold Time Before Switching to Primary Priority

When an MX Series router or an EX Series switch in a VPLS multihomed Layer 2 ring is running a spanning-tree protocol with root protection enabled, you can modify the default actions taken by the router or switch when the topology changes. To do this, configure the VPLS root protection topology change actions.

The default number of seconds to hold before switching to the primary priority when the first core domain comes up is 2 seconds.

To change the default value, you can use the following statement:

priority-hold-time seconds

You can include the statement at the **[edit protocols (mstp | rstp | vstp)]** hierarchy level (to control global spanning-tree protocol behavior) or at the **[edit protocols vstp vlan vlan-id]** hierarchy level (to control a particular VLAN).



NOTE: VPLS root topology change actions are configured independently of VPLS, the spanning-tree protocol, or the spanning-tree protocol root protect option.

**Related
Documentation**

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihoming: Priority of the Backup Bridge on page 21](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

VPLS Multihoming: System Identifier for Bridges in the Ring

When an MX Series router or an EX Series switch in a VPLS multihomed Layer 2 ring is running a spanning-tree protocol with root protection enabled, you can modify the default actions taken by the router or switch when the topology changes. To do this, configure the VPLS root protection topology change actions.

The system identifier for bridges in the ring is not configured by default.

To configure a system identifier for bridges in the ring, you can use the following statement:

```
system-id system-id-value bridge-host-ip-address(es)
```

You can include the statement at the **[edit protocols (mstp | rstp | vstp)]** hierarchy level (to control global spanning-tree protocol behavior) or at the **[edit protocols vstp vlan *vlan-id*]** hierarchy level (to control a particular VLAN).



NOTE: VPLS root topology change actions are configured independently of VPLS, the spanning-tree protocol, or the spanning-tree protocol root protect option.

**Related
Documentation**

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihoming: Priority of the Backup Bridge on page 21](#)
- [VPLS Multihoming: Hold Time Before Switching to Primary Priority on page 21](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

VPLS Multihoming: Bridge Flush of MAC Cache on Topology Change

When an MX Series router or an EX Series switch in a VPLS multihomed Layer 2 ring is running a spanning-tree protocol with root protection enabled, you can modify the default actions taken by the router or switch when the topology changes. To do this, configure the VPLS root protection topology change actions.

By default, if root protect is enabled and then the topology changes, the bridges do not flush the media access control (MAC) address cache of the MAC addresses learned when other interface ports were blocked.

To change the default behavior, you can use the following statement:

vpls-flush-on-topology-change

You can include the statement at the **[edit protocols (mstp | rstp | vstp)]** hierarchy level (to control global spanning-tree protocol behavior) or at the **[edit protocols vstp vlan *vlan-id*]** hierarchy level (to control a particular VLAN).

Specifically, MAC flush messages are sent from the blocked PE to LDP peers based on the mapping of system identifier to IP addresses as specified using the **system-id** statement.



NOTE: VPLS root topology change actions are configured independently of VPLS, the spanning-tree protocol, or the spanning-tree protocol root protect option.

Related Documentation

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior on page 62](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

PART 2

Configuration

- [Configuration Examples on page 27](#)
- [Configuration Tasks on page 43](#)
- [Configuration Statements on page 65](#)

CHAPTER 2

Configuration Examples

- [Example: Blocking BPDUs on Aggregated Ethernet for 600 Seconds on page 27](#)
- [Example: Enabling Loop Protection for Spanning-Tree Protocols on page 27](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)
- [Example: Configuring VSTP on a Trunk Port with Tagged Traffic on page 28](#)
- [Example: Tracing Spanning-Tree Protocol Operations on page 40](#)

Example: Blocking BPDUs on Aggregated Ethernet for 600 Seconds

The following example, when used with a full bridge configuration with aggregated Ethernet, blocks BPDUs on aggregated interface **ae0** for ten minutes (600 seconds) before enabling the interface again:

```
[edit protocols layer2-control]
bpdud-block {
  interface ae0;
  disable-timeout 600;
}
```

Related Documentation

- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20](#)
- [BPDU Protection on All Edge Ports of the Bridge on page 20](#)
- [Checking the Status of Spanning-Tree Instance Interfaces on page 105](#)
- [Clearing the Blocked Status of a Spanning-Tree Instance Interface on page 106](#)

Example: Enabling Loop Protection for Spanning-Tree Protocols

This example blocks and logs the non-designated RSTP port **ge-1/2/0** after the BPDU timeout interval expires:

```
[edit]
protocols {
  rstp {
    interface ge-1/2/0 {
      bpdud-timeout-action block;
```

```
}  
}  
}
```



NOTE: This is not a complete configuration. You must also fully configure RSTP, including the ge-1/2/0 interface.

**Related
Documentation**

- [Loop Protection for a Spanning-Tree Instance Interface on page 19](#)
- [Loop Protection for Spanning-Tree Instance Interfaces Overview on page 6](#)

Example: Configuring VPLS Root Topology Change Actions

This example configures a bridge priority of **36k**, a backup bridge priority of **44k**, a priority hold time value of **60** seconds, a system identifier of **000203:040506** for IP address **10.1.1.1/32**, and sets the bridge to flush the MAC cache on a topology change for MSTP only.

```
[edit]  
protocols {  
  mstp {  
    bridge-priority 36k;  
    backup-bridge-priority 44k;  
    priority-hold-time 60;  
    system-id 000203:040506 {  
      10.1.1.1/32;  
    }  
    vpls-flush-on-topology-change;  
  }  
}
```



NOTE: This is not a complete configuration.

**Related
Documentation**

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology on page 9](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior on page 62](#)

Example: Configuring VSTP on a Trunk Port with Tagged Traffic

- [VSTP on a Trunk Port with Tagged Traffic Overview on page 29](#)
- [Example: Configuring VSTP on a Trunk Port with Tagged Traffic on page 29](#)

VSTP on a Trunk Port with Tagged Traffic Overview

In 802.1ad provider bridge networks (stacked VLANs), single-tagged access ports and double-tagged trunk ports can co-exist in a single spanning tree context. In this mode, the VLAN Spanning Tree Protocol (VSTP) can send and receive untagged Rapid Spanning Tree Protocol (RSTP) bridge protocol data units (BPDUs) on gigabit Ethernet (ge), 10 gigabit Ethernet (xe), and aggregated Ethernet (ae) interfaces. The untagged RSTP BPDUs interoperate with tagged VSTP BPDUs sent over the double-tagged trunk ports.

Double-tagging can be useful for Internet service providers, allowing them to use VLANs internally while mixing traffic from clients that are already VLAN-tagged.

Example: Configuring VSTP on a Trunk Port with Tagged Traffic

This example shows how to configure the VSTP to send and receive standard untagged Rapid Spanning Tree Protocol (RSTP) bridge protocol data units (BPDUs) on access trunks that interoperate with tagged VSTP BPDUs sent over the double-tagged trunk ports.

- [Requirements on page 29](#)
- [Overview on page 29](#)
- [Configuration on page 30](#)
- [Verification on page 38](#)

Requirements

This example uses the following hardware and software components:

- Two CE devices (MX Series routers with DPCE or MPC cards)
- Two PE devices (MX Series routers with DPCE or MPC cards)
- Junos OS Release 12.3 or later running on the PE devices

Overview

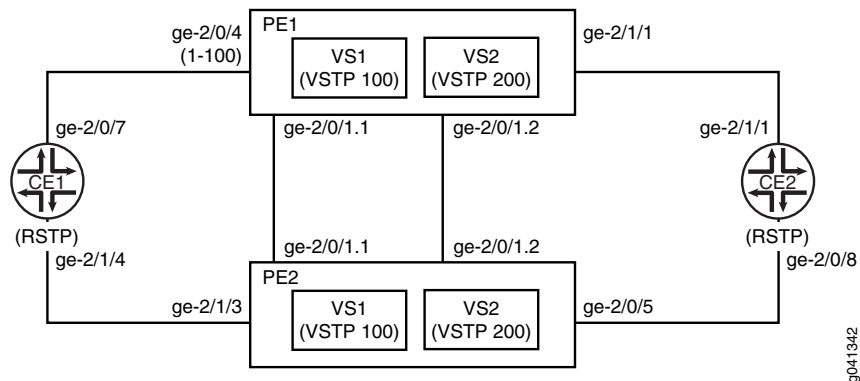
This example shows how to configure VSTP on a trunk port with tagged traffic.

Topology

[Figure 2 on page 30](#) shows a sample topology in which two customer edge (CE) bridges are dual-homed to two provider edge (PE) devices. All of the PE-CE links are single-tagged trunks using C-VLANs 1-100. The core link between Devices PE1 and PE2 is a double-tagged trunk that carries traffic from both CE devices, using S-VLANs 100 and 200 to distinguish the CE traffic.

Two VSTP instances are created on the PE devices, one for each S-VLAN. The CE devices run the standard RSTP. The PE devices run VSTP on the core link while sending standard untagged RSTP BPDUs toward the CE devices.

Figure 2: Topology for VSTP Configured on a Trunk Port with Tagged Traffic



Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

Device PE1

```
set interfaces ge-2/0/1 flexible-vlan-tagging
set interfaces ge-2/0/1 encapsulation flexible-ethernet-services
set interfaces ge-2/0/1 unit 1 vlan-id 100
set interfaces ge-2/0/1 unit 1 family bridge interface-mode trunk
set interfaces ge-2/0/1 unit 1 family bridge inner-vlan-id-list 1-100
set interfaces ge-2/0/1 unit 2 vlan-id 200
set interfaces ge-2/0/1 unit 2 family bridge interface-mode trunk
set interfaces ge-2/0/1 unit 2 family bridge inner-vlan-id-list 1-100
set interfaces ge-2/0/4 encapsulation ethernet-vpls
set interfaces ge-2/0/4 unit 0 description to_CE1
set interfaces ge-2/0/4 unit 0 family bridge interface-mode trunk
set interfaces ge-2/0/4 unit 0 family bridge vlan-id-list 1-100
set interfaces ge-2/1/1 unit 0 description to_CE2
set interfaces ge-2/1/1 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/1 unit 0 family bridge vlan-id-list 1-100
set routing-instances vs1 instance-type virtual-switch
set routing-instances vs1 interface ge-2/0/1.1
set routing-instances vs1 interface ge-2/0/4.0
set routing-instances vs1 protocols vstp vlan 100 interface ge-2/0/1
set routing-instances vs1 protocols vstp vlan 100 interface ge-2/0/4 access-trunk
set routing-instances vs1 bridge-domains bd vlan-id-list 1-100
set routing-instances vs2 instance-type virtual-switch
set routing-instances vs2 interface ge-2/0/1.2
set routing-instances vs2 interface ge-2/1/1.0
set routing-instances vs2 protocols vstp vlan 200 interface ge-2/0/1
set routing-instances vs2 protocols vstp vlan 200 interface ge-2/1/1 access-trunk
set routing-instances vs2 bridge-domains bd vlan-id-list 1-100
```

Device PE2

```
set interfaces ge-2/0/1 flexible-vlan-tagging
set interfaces ge-2/0/1 encapsulation flexible-ethernet-services
set interfaces ge-2/0/1 unit 1 vlan-id 100
```

```

set interfaces ge-2/0/1 unit 1 family bridge interface-mode trunk
set interfaces ge-2/0/1 unit 1 family bridge inner-vlan-id-list 1-100
set interfaces ge-2/0/1 unit 2 vlan-id 200
set interfaces ge-2/0/1 unit 2 family bridge interface-mode trunk
set interfaces ge-2/0/1 unit 2 family bridge inner-vlan-id-list 1-100
set interfaces ge-2/1/3 description to_CE1
set interfaces ge-2/1/3 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/3 unit 0 family bridge vlan-id-list 1-100
set interfaces ge-2/0/5 description to_CE2
set interfaces ge-2/0/5 unit 0 family bridge interface-mode trunk
set interfaces ge-2/0/5 unit 0 family bridge vlan-id-list 1-100
set routing-instances vs1 instance-type virtual-switch
set routing-instances vs1 interface ge-2/0/1.1
set routing-instances vs1 interface ge-2/1/3.0
set routing-instances vs1 protocols vstp vlan 100 interface ge-2/0/1
set routing-instances vs1 protocols vstp vlan 100 interface ge-2/1/3 access-trunk
set routing-instances vs1 bridge-domains bd vlan-id-list 1-100
set routing-instances vs2 instance-type virtual-switch
set routing-instances vs2 interface ge-2/0/1.2
set routing-instances vs2 interface ge-2/0/5.0
set routing-instances vs2 protocols vstp vlan 200 interface ge-2/0/1
set routing-instances vs2 protocols vstp vlan 200 interface ge-2/0/5 access-trunk
set routing-instances vs2 bridge-domains bd vlan-id-list 1-100

```

Device CE1

```

set interfaces ge-2/0/7 unit 0 description to_PE1
set interfaces ge-2/0/7 unit 0 family bridge interface-mode trunk
set interfaces ge-2/0/7 unit 0 family bridge vlan-id-list 1-100
set interfaces ge-2/1/4 unit 0 description to_PE2
set interfaces ge-2/1/4 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/4 unit 0 family bridge vlan-id-list 1-100
set protocols rstp interface ge-2/0/7
set protocols rstp interface ge-2/1/4
set bridge-domains bd vlan-id-list 1-100

```

Device CE2

```

set interfaces ge-2/0/8 unit 0 description to_PE2
set interfaces ge-2/0/8 unit 0 family bridge interface-mode trunk
set interfaces ge-2/0/8 unit 0 family bridge vlan-id-list 1-100
set interfaces ge-2/1/1 unit 0 description to_PE1
set interfaces ge-2/1/1 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/1 unit 0 family bridge vlan-id-list 1-100
set protocols rstp interface ge-2/0/8
set protocols rstp interface ge-2/1/1
set bridge-domains bd vlan-id-list 1-100

```

Configuring PE1, PE2, CE1, and CE2

Step-by-Step Procedure The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the CLI User Guide.

To configure Device PE1:

1. Configure the network interfaces.

```

[edit interfaces]
user@PE1# set ge-2/0/1 flexible-vlan-tagging

```

```
user@PE1# set ge-2/0/1 encapsulation flexible-ethernet-services
user@PE1# set ge-2/0/1 unit 1 vlan-id 100
user@PE1# set ge-2/0/1 unit 1 family bridge interface-mode trunk
user@PE1# set ge-2/0/1 unit 1 family bridge inner-vlan-id-list 1-100
user@PE1# set ge-2/0/1 unit 2 vlan-id 200
user@PE1# set ge-2/0/1 unit 2 family bridge interface-mode trunk
user@PE1# set ge-2/0/1 unit 2 family bridge inner-vlan-id-list 1-100
```

```
user@PE1# set ge-2/0/4 encapsulation ethernet-vpls
user@PE1# set ge-2/0/4 unit 0 description to_CE1
user@PE1# set ge-2/0/4 unit 0 family bridge interface-mode trunk
user@PE1# set ge-2/0/4 unit 0 family bridge vlan-id-list 1-100
```

```
user@PE1# set ge-2/1/1 unit 0 description to_CE2
user@PE1# set ge-2/1/1 unit 0 family bridge interface-mode trunk
user@PE1# set ge-2/1/1 unit 0 family bridge vlan-id-list 1-100
```

2. Configure the routing instances.

```
[edit routing-instances]
user@PE1# set vs1 instance-type virtual-switch
user@PE1# set vs1 interface ge-2/0/1.1
user@PE1# set vs1 interface ge-2/0/4.0
user@PE1# set vs1 protocols vstp vlan 100 interface ge-2/0/1
user@PE1# set vs1 protocols vstp vlan 100 interface ge-2/0/4 access-trunk
user@PE1# set vs1 bridge-domains bd vlan-id-list 1-100
```

```
user@PE1# set vs2 instance-type virtual-switch
user@PE1# set vs2 interface ge-2/0/1.2
user@PE1# set vs2 interface ge-2/1/1.0
user@PE1# set vs2 protocols vstp vlan 200 interface ge-2/0/1
user@PE1# set vs2 protocols vstp vlan 200 interface ge-2/1/1 access-trunk
user@PE1# set vs2 bridge-domains bd vlan-id-list 1-100
```

Step-by-Step Procedure

To configure Device PE2:

1. Configure the interfaces.

```
[edit interfaces]
user@PE2# set ge-2/0/1 flexible-vlan-tagging
user@PE2# set ge-2/0/1 encapsulation flexible-ethernet-services
user@PE2# set ge-2/0/1 unit 1 vlan-id 100
user@PE2# set ge-2/0/1 unit 1 family bridge interface-mode trunk
user@PE2# set ge-2/0/1 unit 1 family bridge inner-vlan-id-list 1-100
user@PE2# set ge-2/0/1 unit 2 vlan-id 200
user@PE2# set ge-2/0/1 unit 2 family bridge interface-mode trunk
user@PE2# set ge-2/0/1 unit 2 family bridge inner-vlan-id-list 1-100
```

```
user@PE2# set ge-2/1/3 description to_CE1
user@PE2# set ge-2/1/3 unit 0 family bridge interface-mode trunk
user@PE2# set ge-2/1/3 unit 0 family bridge vlan-id-list 1-100
```

```
user@PE2# set ge-2/0/5 description to_CE2
user@PE2# set ge-2/0/5 unit 0 family bridge interface-mode trunk
```



```
user@PE2# set ge-2/0/5 unit 0 family bridge vlan-id-list 1-100
```

2. Configure the routing instances.

```
[edit routing-instances]
user@PE2# set vs1 instance-type virtual-switch
user@PE2# set vs1 interface ge-2/0/1.1
user@PE2# set vs1 interface ge-2/1/3.0
user@PE2# set vs1 protocols vstp vlan 100 interface ge-2/0/1
user@PE2# set vs1 protocols vstp vlan 100 interface ge-2/1/3 access-trunk
user@PE2# set vs1 bridge-domains bd vlan-id-list 1-100
```

```
user@PE2# set vs2 instance-type virtual-switch
user@PE2# set vs2 interface ge-2/0/1.2
user@PE2# set vs2 interface ge-2/0/5.0
user@PE2# set vs2 protocols vstp vlan 200 interface ge-2/0/1
user@PE2# set vs2 protocols vstp vlan 200 interface ge-2/0/5 access-trunk
user@PE2# set vs2 bridge-domains bd vlan-id-list 1-100
```

Step-by-Step Procedure To configure CE1:

1. Configure the interfaces.

```
[edit interfaces]
user@CE1# set ge-2/0/7 unit 0 description to_PE1
user@CE1# set ge-2/0/7 unit 0 family bridge interface-mode trunk
user@CE1# set ge-2/0/7 unit 0 family bridge vlan-id-list 1-100
```

```
user@CE1# set ge-2/1/4 unit 0 description to_PE2
user@CE1# set ge-2/1/4 unit 0 family bridge interface-mode trunk
user@CE1# set ge-2/1/4 unit 0 family bridge vlan-id-list 1-100
```

2. Configure the protocols.

```
[edit protocols]
user@CE1# set rstp interface ge-2/0/7
user@CE1# set rstp interface ge-2/1/4
```

3. Configure the bridge domain.

```
[edit bridge-domains]
user@CE1# set bd vlan-id-list 1-100
```

Step-by-Step Procedure To configure CE2:

1. Configure the interfaces.

```
[edit interfaces]
user@CE2# set ge-2/0/8 unit 0 description to_PE2
user@CE2# set ge-2/0/8 unit 0 family bridge interface-mode trunk
user@CE2# set ge-2/0/8 unit 0 family bridge vlan-id-list 1-100
```

```
user@CE2# set ge-2/1/1 unit 0 description to_PE1
user@CE2# set ge-2/1/1 unit 0 family bridge interface-mode trunk
user@CE2# set ge-2/1/1 unit 0 family bridge vlan-id-list 1-100
```

2. Configure the protocols.

```
[edit protocols]
user@CE2# set rstp interface ge-2/0/8
user@CE2# set rstp interface ge-2/1/1
```

3. Configure the bridge domain.

```
[edit bridge-domains]
user@CE2# set bd vlan-id-list 1-100
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces**, **show routing-instances**, **show protocols**, and **show bridge-domains** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
Device PE1 user@PE1# show interfaces
ge-2/0/1 {
  flexible-vlan-tagging;
  encapsulation flexible-ethernet-services;
  unit 1 {
    vlan-id 100;
    family bridge {
      interface-mode trunk;
      inner-vlan-id-list 1-100;
    }
  }
  unit 2 {
    vlan-id 200;
    family bridge {
      interface-mode trunk;
      inner-vlan-id-list 1-100;
    }
  }
}
ge-2/0/4 {
  encapsulation ethernet-vpls;
  unit 0 {
    description to_CE1;
    family bridge {
      interface-mode trunk;
      vlan-id-list 1-100;
    }
  }
}
ge-2/1/1 {
  unit 0 {
    description to_CE2;
    family bridge {
      interface-mode trunk;
      vlan-id-list 1-100;
    }
  }
}

user@PE1# show routing-instances
```

```

vs1 {
  instance-type virtual-switch;
  interface ge-2/0/1.1;
  interface ge-2/0/4.0;
  protocols {
    vstp {
      vlan 100 {
        interface ge-2/0/1;
        interface ge-2/0/4 {
          access-trunk;
        }
      }
    }
  }
  bridge-domains {
    bd {
      vlan-id-list 1-100;
    }
  }
}
vs2 {
  instance-type virtual-switch;
  interface ge-2/0/1.2;
  interface ge-2/0/1.0;
  protocols {
    vstp {
      vlan 200 {
        interface ge-2/0/1;
        interface ge-2/1/1 {
          access-trunk;
        }
      }
    }
  }
  bridge-domains {
    bd {
      vlan-id-list 1-100;
    }
  }
}

```

```

Device PE2 user@PE2# show interfaces
ge-2/0/1 {
  flexible-vlan-tagging;
  encapsulation flexible-ethernet-services;
  unit 1 {
    vlan-id 100;
    family bridge {
      interface-mode trunk;
      inner-vlan-id-list 1-100;
    }
  }
  unit 2 {
    vlan-id 200;
    family bridge {
      interface-mode trunk;
    }
  }
}

```

```
        inner-vlan-id-list 1-100;
    }
}
ge-2/0/5 {
    description to_CE2;
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1-100;
        }
    }
}
ge-2/1/3 {
    description to_CE1;
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1-100;
        }
    }
}

user@PE2# show routing-instances
vs1 {
    instance-type virtual-switch;
    interface ge-2/0/1.1;
    interface ge-2/1/3.0;
    protocols {
        vstp {
            vlan 100 {
                interface ge-2/0/1;
                interface ge-2/1/3 {
                    access-trunk;
                }
            }
        }
    }
    bridge-domains {
        bd {
            vlan-id-list 1-100;
        }
    }
}
vs2 {
    instance-type virtual-switch;
    interface ge-2/0/1.2;
    interface ge-2/0/5.0;
    protocols {
        vstp {
            vlan 200 {
                interface ge-2/0/1;
                interface ge-2/0/5 {
                    access-trunk;
                }
            }
        }
    }
}
```

```

    }
  }
  bridge-domains {
    bd {
      vlan-id-list 1-100;
    }
  }
}

Device CE1 user@CE1# show interfaces
ge-2/0/7 {
  unit 0 {
    description to_PE1;
    family bridge {
      interface-mode trunk;
      vlan-id-list 1-100;
    }
  }
}
ge-2/1/4 {
  unit 0 {
    description to_PE2;
    family bridge {
      interface-mode trunk;
      vlan-id-list 1-100;
    }
  }
}

user@CE1# show protocols
rstp {
  interface ge-2/0/7;
  interface ge-2/1/4;
}

user@CE1# show bridge-domains
bd {
  vlan-id-list 1-100;
}

Device CE2 user@CE2 show interfaces
ge-2/0/8 {
  unit 0 {
    description to_PE2;
    family bridge {
      interface-mode trunk;
      vlan-id-list 1-100;
    }
  }
}
ge-2/1/1 {
  unit 0 {
    description to_PE1;
    family bridge {
      interface-mode trunk;
      vlan-id-list 1-100;
    }
  }
}

```

```
}  
}  
  
user@CE2# show protocols  
rstp {  
    interface ge-2/0/8;  
    interface ge-2/1/1;  
}  
  
user@CE2# show bridge-domains  
bd {  
    vlan-id-list 1-100;  
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- [Verifying That the Interfaces Are Operational on page 38](#)
- [Verifying the STP Bridge Parameters of the Routing Instances on page 38](#)
- [Displaying STP Statistics for the Configured Bridge on page 39](#)

Verifying That the Interfaces Are Operational

Purpose Verify that the interfaces are operational.

Action From operational mode, enter the **show spanning-tree interface routing-instance** command.

```
user@PE1> show spanning-tree interface routing-instance vs1  
Spanning tree interface parameters for VLAN 100
```

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ge-2/0/1	128:82	128:82	32868.0021590f37d0	20000	FWD	DESG
ge-2/0/4	128:85	128:85	32868.0021590f37d0	20000	FWD	DESG

Meaning The output shows the status of the interfaces configured for VLAN 100.

Verifying the STP Bridge Parameters of the Routing Instances

Purpose Verify the STP bridge parameters configured for the routing instances.

Action From operational mode, enter the **show spanning-tree bridge routing-instance** command.

```
user@PE1> show spanning-tree bridge routing-instance vs1
STP bridge parameters
Routing instance name      : vs1
Enabled protocol          : RSTP

STP bridge parameters for VLAN 100
Root ID                   : 32868.00:21:59:0f:37:d0
Hello time                 : 2 seconds
Maximum age                : 20 seconds
Forward delay              : 15 seconds
Message age                : 0
Number of topology changes : 2
Time since last topology change : 687 seconds
Local parameters
  Bridge ID                : 32868.00:21:59:0f:37:d0
  Extended system ID       : 100
```

Meaning The output shows the status of the STP bridge parameters for routing instance vs1.

Displaying STP Statistics for the Configured Bridge

Purpose Display spanning-tree statistics for the configured bridge.

Action From operational mode, enter the **show spanning-tree statistics bridge** command.

```
user@PE1> show spanning-tree statistics bridge
STP Context : default
STP Instance : 0
Number of Root Bridge Changes: 0
Number of Root Port Changes: 0

STP Context : x/default
STP Instance : 0
Number of Root Bridge Changes: 0
Number of Root Port Changes: 0

STP Context : vs1
STP Instance : 0
Number of Root Bridge Changes: 2          Last Changed: Thu Sep 20 15:12:18
2012
Number of Root Port Changes: 1          Last Changed: Thu Sep 20 15:01:13
2012
Recent TC Received: ge-2/0/1.1          Received : Thu Sep 20 15:01:17
2012

STP Context : vs2
STP Instance : 0
Number of Root Bridge Changes: 2          Last Changed: Thu Sep 20 15:10:25
2012
Number of Root Port Changes: 2          Last Changed: Thu Sep 20 15:10:25
2012
Recent TC Received: ge-2/1/1.0          Received : Thu Sep 20 15:10:47
2012

STP Context : CE1/default
STP Instance : 0
Number of Root Bridge Changes: 0
Number of Root Port Changes: 0
Recent TC Received: ge-2/1/4.0          Received : Thu Sep 20 15:12:15
2012
```

Meaning The command output shows spanning-tree statistics for the configured bridge.

Example: Tracing Spanning-Tree Protocol Operations

Trace only unusual or abnormal operations to **/var/log/stp-log**:

```
[edit]
routing-options {
  traceoptions {
    file /var/log/routing-log;
    flag errors;
  }
}
protocols {
  rstp {
    traceoptions {
      file /var/log/stp-log;
    }
  }
}
```


- Related Documentation**
- [Spanning-Tree Protocols Supported on page 4](#)
 - [Tracing Spanning-Tree Operations on page 107](#)

CHAPTER 3

Configuration Tasks

- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring MST Instances on a Physical Interface on page 47](#)
- [Disabling MSTP on page 48](#)
- [Provider Bridge Participation in RSTP or MSTP Instances on page 49](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 49](#)
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 52](#)
- [Provider Bridge Participation in RSTP or MSTP Instances on page 53](#)
- [System Identifier for Bridges in STP or RSTP Instances on page 53](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 58](#)
- [Configuring Loop Protection for a Spanning-Tree Instance Interface on page 59](#)
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- [Configuring BPDU Protection on Individual Interfaces on page 61](#)
- [Configuring BPDU Protection on All Edge Ports on page 62](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior on page 62](#)
- [Configuring Layer 2 Protocol Tunneling on page 64](#)

Configuring Multiple Spanning-Tree Protocol

You can configure the Multiple Spanning-Tree Protocol (MSTP) under the following hierarchy levels:

- [edit logical-systems *logical-system-name* protocols]
- [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols]
- [edit protocols]
- [edit routing-instances *routing-instance-name* protocols]

The routing instance type can be either **virtual-switch** or **layer2-control**.

To configure the Multiple Spanning-Tree Protocol:

1. Enable RSTP as the version of spanning-tree protocol to be configured:

```
[edit]
user@host@ edit ... protocols (STP Type) mstp
```

2. (Optional) Enable provider bridge participation in the MSTP instance:

```
[edit ... protocols mstp]
user@host# set bpdu-destination-mac-address provider-bridge-group
```

3. Configure the interfaces that participate in the MSTP instance.

- a. Enable configuration of the interface:

```
[edit ... protocols mstp]
user@host# edit interface interface-name
```

- b. Configure the interface priority:

```
[edit ... protocols mstp interface interface-name]
user@host# set priority interface-priority
```

- c. (Optional) By default, the interface link cost is determined by the link speed. You can configure the interface link cost to control which bridge is the designated bridge and which port is the designated port:

```
[edit ... protocols mstp interface interface-name]
user@host# set cost interface-link-cost
```

- d. Configure the interface link mode to identify point-to-point links:

```
[edit ... protocols mstp interface interface-name]
user@host# set mode (p2p | shared)
```

Specify **p2p** if the link is point to point. Specify **shared** if the link is a shared media.

- e. (Optional) Configure the interface as an edge port:

```
[edit ... protocols mstp interface interface-name]
user@host# set edge
```

Edge ports do not expect to receive bridge protocol data unit (BPDU) packets. If a BPDU packet is received for an edge port, the port becomes a nonedge port.

You can also enable BPDU root protection for all spanning-tree protocol instances on the interface. BPDU root protect ensures the port is the spanning-tree designated port. If the port receives superior BPDU packets, root protect moves this port to a root-prevented spanning-tree state. For configuration details, see [“Checking the Status of Spanning-Tree Instance Interfaces” on page 105](#).

4. Configure the bridge priority

```
[edit ... protocols mstp]
user@host# set bridge-priority bridge-priority
```

For more information, see [“Bridge Priority for Election of Root Bridge and Designated Bridge” on page 13](#).

5. Configure hello BPDU timers.

- a. Configure the maximum expected arrival time of hello BPDUs:

```
[edit ... protocols mstp]
user@host# set max-age seconds
```

- b. Configure the time interval at which the root bridge transmits configuration BPDUs:

```
[edit ... protocols mstp]
user@host# set hello-time seconds
```

6. (Optional) By default, the bridge port remains in the listening and learning states for 15 seconds before transitioning to the forwarding state. You can specify a delay from 4 through 20 seconds instead:

```
[edit ... protocols mstp]
```

```
user@host# set forward-delay seconds
```

7. Configure MSTP-specific options.

a. Configure the MSTP region configuration name:

```
[edit ... protocols mstp]
user@host# set configuration-name configuration-name
```

b. Configure the MSTP revision level:

```
[edit ... protocols mstp]
user@host# set revision-level revision-level revision-level
```

c. Configure the maximum number of hops a BPDU can be forwarded in the MSTP region:

```
[edit ... protocols mstp]
user@host# set max-hops hops
```

8. Verify the MSTP configuration:

```
[edit]
... { # Optional logical system and/or routing instance
  protocols (STP Type) {
    mstp {
      bpd-destination-mac-address provider-bridge-group; # Optional
      interface interface-name {
        priority interface-priority;
        cost interface-link-cost; # Optional.
        mode (p2p | shared);
        edge; # Optional.
      }
      bridge-priority bridge-priority;
      max-age seconds;
      hello-time seconds;
      forward-delay seconds; # Optional.
      configuration-name configuration-name; # MST region configuration name.
      revision-level revision-level; # MST revision number.
      max-hops hops; # MST maximum hops.
    }
  }
}
```

- Related Documentation**
- [Spanning-Tree Protocols Supported on page 4](#)
 - [Configuring MST Instances on a Physical Interface on page 47](#)
 - [Disabling MSTP on page 48](#)

Configuring MST Instances on a Physical Interface

You can configure a Multiple Spanning-Tree Instance (MSTI) under the following hierarchy levels:

- [edit logical-systems *logical-system-name* protocols mstp]
- [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols mstp]
- [edit protocols mstp]
- [edit routing-instances *routing-instance-name* protocols mstp]

The routing instance type can be either **virtual-switch** or **layer2-control**.

Before you begin, configure Multiple Spanning-Tree Protocol. For configuration details, see “Configuring MSTP” on page 44.

1. Enable configuration of a MST instance:

```
[edit]
user@host# edit ... protocols mstp msti msti-id
The msti-id value must be from 1 through 64.
```

2. Configure the interfaces that participate in the MST instance.

- a. Enable configuration of the interface:

```
[edit ... protocols mstp msti msti-id]
user@host# edit interface interface-name
```

- b. Configure the interface priority:

```
[edit ... protocols mstp msti msti-id interface interface-name]
user@host# set priority interface-priority
```

- c. (Optional) By default, the interface link cost is determined by the link speed. You can configure the interface link cost to control which bridge is the designated bridge and which port is the designated port:

```
[edit ... protocols mstp msti msti-id interface interface-name]
user@host# set cost interface-link-cost
```

- d. (Optional) Configure the interface as an edge port:

```
[edit ... protocols mstp msti msti-id interface interface-name]
user@host# set edge
```

Edge ports do not expect to receive bridge protocol data unit (BPDU) packets. If a BPDU packet is received for an edge port, the port becomes a nonedge port

3. Configure the bridge priority

```
[edit ... protocols mstp msti msti-id]
user@host# set bridge-priority bridge-priority
```

For more information, see “Bridge Priority for Election of Root Bridge and Designated Bridge” on page 13.

4. (Optional) An MSTI can map to a range of VLANs just as a logical port can map to a range of VLANs. The MSTP VLAN specifies the VLAN or VLAN range to which this MSTI is mapped. The `vlan-id` is configured under the logical interface. Configure the VLAN or VLAN range of the MSTI instance:

```
[edit]
user@host# set vlan (vlan-id | vlan-id-range)
```

5. Verify the MST interface configuration.

```
[edit]
protocols {
  mstp {
    ...basic-mstp-configuration...
    msti msti-id { # Instance identifier 1 – 64.
      bridge-priority priority;
      vlan vlan-id; # Optional
      interface interface-name {
        cost cost;
        edge;
        priority interface-priority;
      }
    }
  }
}
```

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Disabling MSTP on page 48](#)

Disabling MSTP

To disable the entire MSTP instance:

- Include the `disable` statement. You can include this statement at the following hierarchy levels:
 - `[edit logical-systems logical-system-name protocols mstp]`
 - `[edit logical-systems logical-system-name routing-instances routing-instance-name protocols mstp]`
 - `[edit protocols mstp]`
 - `[edit routing-instances routing-instance-name protocols mstp]`

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [Configuring MST Instances on a Physical Interface on page 47](#)

Provider Bridge Participation in RSTP or MSTP Instances

A provider network can bridge the customer STP BPDU packets between customer sites by default. At the same time, the provider network can prevent forwarding loops by running a spanning-tree protocol in the provider network. On an MX Series router running Rapid Spanning-Tree Protocol (RSTP) or Multiple Spanning-Tree Protocol (MSTP) in a provider network, you can enable provider bridge participation in the RSTP or MSTP instance.

The IEEE 802.1ad specification reserves the group MAC address value of **01:80:c2:00:00:08** to designate the *provider bridge group*. On an MX Series router for which you have enabled provider bridge participation in the RSTP or MSTP instance, the router exchanges BPDU packets with the provider bridge group as follows:

- Transmitted BPDU packets contain the destination MAC address **01:80:c2:00:00:08**.
- Received BPDU packets with the destination MAC address **01:80:c2:00:00:08** are accepted and passed to the Routing Engine.

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [bpdu-destination-mac-address on page 69](#)

RSTP or VSTP Forced to Run as IEEE 802.1D STP

On MX Series routers or EX Series switches in a Layer 2 environment, you can force the configured Rapid Spanning-Tree Protocol (RSTP) or VLAN Spanning-Tree Protocol (VSTP) to run as the original IEEE 802.1D Spanning-Tree Protocol (STP) version. Configure this option for compatibility with older bridges that do not support RSTP or VSTP.

Keep the following limitations in mind when RSTP or VSTP are run as the original STP version:

- If you configure an instance interface as an edge port, the configuration statement is ignored.
- If you configure point-to-point link mode for an instance interface, the configuration statement is ignored.

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)
- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 52](#)
- [force-version on page 74](#)

Configuring Rapid Spanning-Tree Protocol

You can configure Rapid Spanning-Tree Protocol (RSTP) under the following hierarchy levels:

- [edit logical-systems *logical-system-name* protocols]
- [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols]
- [edit protocols]
- [edit routing-instances *routing-instance-name* protocols]

The routing instance type can be either **virtual-switch** or **layer2-control**.

To configure the Rapid Spanning-Tree Protocol:

1. Enable RSTP as the version of spanning-tree protocol to be configured:

```
[edit]
user@host@ edit ... protocols (STP Type) rstp
```

2. (Optional) For compatibility with older bridges that do not support RSTP, you can run force RSTP to run as the original IEEE 802.1D Spanning-Tree Protocol (STP) version:

```
[edit ... protocols rstp]
user@host# set force-version stp
```



NOTE: If RSTP has been forced to run as the original STP version, you can revert back to RSTP by first removing the **force-version** statement from the configuration and then entering the **clear spanning-tree protocol-migration** configuration mode command.

3. (Optional) Enable provider bridge participation in the RSTP instance:

```
[edit ... protocols rstp]
user@host# set bpd-destination-mac-address provider-bridge-group
```

4. (Optional) Specify the extended system identifier used in identifiers bridges that participate in RSTP:

```
[edit ... protocols rstp]
user@host# set extended-system-id identifier
```

5. Configure the interfaces that participate in the RSTP instance.

- a. Enable configuration of the interface:

```
[edit ... protocols rstp]
user@host# edit interface interface-name
```

- b. Configure the interface priority:

```
[edit ... protocols rstp interface interface-name]
user@host# set priority interface-priority
```

- c. (Optional) By default, the interface link cost is determined by the link speed. You can configure the interface link cost to control which bridge is the designated bridge and which port is the designated port:

```
[edit ... protocols rstp interface interface-name]
user@host# set cost interface-link-cost
```

- d. Configure the interface link mode to identify point-to-point links:

```
[edit ... protocols rstp interface interface-name]
user@host# set mode (p2p | shared)
```

Specify **p2p** if the link is point to point. Specify **shared** if the link is a shared media.

- e. (Optional) Configure the interface as an edge port:

```
[edit ... protocols rstp interface interface-name]
user@host# set edge
```

Edge ports do not expect to receive bridge protocol data unit (BPDU) packets. If a BPDU packet is received for an edge port, the port becomes a nonedge port.

You can also enable BPDU root protection for all spanning-tree protocol instances on the interface. BPDU root protect ensures the port is the spanning-tree designated port. If the port receives superior BPDU packets, root protect moves this port to a root-prevented spanning-tree state. For configuration details, see [“Checking the Status of Spanning-Tree Instance Interfaces” on page 105](#).

6. Configure the bridge priority

```
[edit ... protocols rstp]
user@host# set bridge-priority bridge-priority
```

For more information, see [“Bridge Priority for Election of Root Bridge and Designated Bridge” on page 13](#).

7. Configure hello BPDU timers.

- a. Configure the maximum expected arrival time of hello BPDUs:

```
[edit ... protocols rstp]
user@host# set max-age seconds
```

- b. Configure the time interval at which the root bridge transmits configuration BPDUs:

```
[edit ... protocols rstp]
user@host# set hello-time seconds
```

8. (Optional) By default, the bridge port remains in the listening and learning states for 15 seconds before transitioning to the forwarding state. You can specify a delay from 4 through 20 seconds instead:

```
[edit ... protocols rstp]
```

```
user@host# set forward-delay seconds
```

9. Verify the RSTP configuration:

```
[edit]
... { # Optional logical system and/or routing instance
  protocols (STP Type) {
    rstp {
      force-version stp; # Optional.
      bpdudestination-mac-address provider-bridge-group; # Optional
      extended-system-id identifier; # Optional.
      interface interface-name {
        priority interface-priority;
        cost interface-link-cost; # Optional.
        mode (p2p | shared);
        edge; # Optional.
      }
      bridge-priority bridge-priority;
      max-age seconds;
      hello-time seconds;
      forward-delay seconds; # Optional.
    }
  }
}
```

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 49](#)
- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 52](#)
- [Provider Bridge Participation in RSTP or MSTP Instances on page 49](#)
- [System Identifier for Bridges in STP or RSTP Instances on page 53](#)

Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP

On MX Series routers or EX Series switches on which Rapid Spanning-Tree Protocol (RSTP) or VLAN Spanning-Tree Protocol (VSTP) has been forced to run as the original IEEE 802.1D Spanning-Tree Protocol (STP) version, you can revert back to RSTP or VSTP.

To revert from the forced instance of the original IEEE 802.1D STP version back to the configured RSTP or VSTP version:

1. Remove the **force-version** statement from the RSTP or VSTP configuration:

```
user@host# delete force-version
```

Include this statement under the RSTP or VSTP hierarchy level:

- [edit protocols **rstp**]
- [edit protocols **vstp**]
- [edit routing-instances *routing-instance-name* protocols **rstp**]
- [edit routing-instances *routing-instance-name* protocols **vstp**]

2. Revert the forced IEEE 802.1D STP to run as the configured RSTP or VSTP:

```
user@host# clear spanning-tree protocol-migration <interface interface-name>
<routing-instance routing-instance-name>
```

To revert the STP protocol for the specified interface only, specify the **interface *interface-name*** option.

To revert the STP protocol for a particular routing instance only, specify the **routing-instance *routing-instance-name*** option.

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 49](#)
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring VLAN Spanning-Tree Protocol on page 54](#)

Provider Bridge Participation in RSTP or MSTP Instances

A provider network can bridge the customer STP BPDU packets between customer sites by default. At the same time, the provider network can prevent forwarding loops by running a spanning-tree protocol in the provider network. On an MX Series router running Rapid Spanning-Tree Protocol (RSTP) or Multiple Spanning-Tree Protocol (MSTP) in a provider network, you can enable provider bridge participation in the RSTP or MSTP instance.

The IEEE 802.1ad specification reserves the group MAC address value of **01:80:c2:00:00:08** to designate the *provider bridge group*. On an MX Series router for which you have enabled provider bridge participation in the RSTP or MSTP instance, the router exchanges BPDU packets with the provider bridge group as follows:

- Transmitted BPDU packets contain the destination MAC address **01:80:c2:00:00:08**.
- Received BPDU packets with the destination MAC address **01:80:c2:00:00:08** are accepted and passed to the Routing Engine.

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [Configuring Rapid Spanning-Tree Protocol on page 50](#)
- [Configuring Multiple Spanning-Tree Protocol on page 44](#)
- [bpd-destination-mac-address on page 69](#)

System Identifier for Bridges in STP or RSTP Instances

The extended system identifier is used to specify different bridge identifiers for different STP or RSTP routing instances.

Related Documentation

- [Configuring Rapid Spanning-Tree Protocol on page 50](#)

- [extended-system-id on page 74](#)

Configuring VLAN Spanning-Tree Protocol

You can configure the VLAN Spanning-Tree Protocol (VSTP) under the following hierarchy levels:

- [edit logical-systems *logical-system-name* [protocols](#)]
- [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* [protocols](#)]
- [edit [protocols](#)]
- [edit routing-instances *routing-instance-name* [protocols](#)]

The routing instance type can be either **virtual-switch** or **layer2-control**.

To configure the VLAN Spanning-Tree Protocol:

1. Enable VSTP as the version of spanning-tree protocol to be configured:

```
[edit]
user@host@ edit ... protocols \(STP Type\) vstp
```

2. (Optional) For compatibility with older bridges that do not support VSTP, you can run force VSTP to run as the original IEEE 802.1D Spanning-Tree Protocol (STP) version:

```
[edit ... protocols vstp]
user@host# set force-version stp
```



NOTE: If VSTP has been forced to run as the original STP version, you can revert back to VSTP by first removing the **force-version** statement from the configuration and then entering the **clear spanning-tree protocol-migration** configuration mode command.

3. Configure the interfaces that participate in the VSTP instance.

- a. Enable configuration of the interface:

```
[edit ... protocols vstp]
user@host# edit interface interface-name
```

- b. Configure the interface priority:

```
[edit ... protocols vstp interface interface-name]
user@host# set priority interface-priority
```

- c. (Optional) By default, the interface link cost is determined by the link speed. You can configure the interface link cost to control which bridge is the designated bridge and which port is the designated port:

```
[edit ... protocols vstp interface interface-name]
user@host# set cost interface-link-cost
```

- d. Configure the interface link mode to identify point-to-point links:

```
[edit ... protocols vstp interface interface-name]
user@host# set mode (p2p | shared)
```

Specify **p2p** if the link is point to point. Specify **shared** if the link is a shared media.

- e. (Optional) Configure the interface as an edge port:

```
[edit ... protocols vstp interface interface-name]
user@host# set edge
```

Edge ports do not expect to receive bridge protocol data unit (BPDU) packets. If a BPDU packet is received for an edge port, the port becomes a nonedge port.

You can also enable BPDU root protection for all spanning-tree protocol instances on the interface. BPDU root protect ensures the port is the spanning-tree designated port. If the port receives superior BPDU packets, root protect moves this port to a root-prevented spanning-tree state. For configuration details, see [“Checking the Status of Spanning-Tree Instance Interfaces”](#) on page 105.

4. Enable configuration of a VLAN instance:

```
[edit ... protocols vstp]
user@host# edit vlan vlan-id
```

5. Configure the bridge priority

```
[edit ... protocols vstp vlan vlan-id]
user@host# set bridge-priority bridge-priority
```

For more information, see [“Bridge Priority for Election of Root Bridge and Designated Bridge”](#) on page 13.

6. Configure hello BPDU timers.

- a. Configure the maximum expected arrival time of hello BPDUs:

```
[edit ... protocols vstp vlan vlan-id]  
user@host# set max-age seconds
```

- b. Configure the time interval at which the root bridge transmits configuration BPDUs:

```
[edit ... protocols vstp vlan vlan-id]  
user@host# set hello-time seconds
```

7. (Optional) By default, the bridge port remains in the listening and learning states for 15 seconds before transitioning to the forwarding state. You can specify a delay from 4 through 20 seconds instead:

```
[edit ... protocols vstp vlan vlan-id]  
user@host# set forward-delay seconds
```

8. Configure the interfaces that participate in the VSTP instance.

- a. Enable configuration of the interface:

```
[edit ... protocols vstp vlan vlan-id]  
user@host# edit interface interface-name
```

- b. Configure the interface priority:

```
[edit ... protocols vstp vlan vlan-id interface interface-name]  
user@host# set priority interface-priority
```

- c. (Optional) By default, the interface link cost is determined by the link speed. You can configure the interface link cost to control which bridge is the designated bridge and which port is the designated port:

```
[edit ... protocols vstp vlan vlan-id interface interface-name]  
user@host# set cost interface-link-cost
```

- d. Configure the interface link mode to identify point-to-point links:

```
[edit ... protocols vstp vlan vlan-id interface interface-name]  
user@host# set mode (p2p | shared)
```

Specify **p2p** if the link is point to point. Specify **shared** if the link is a shared media.

- e. (Optional) Configure the interface as an edge port:

```
[edit ... protocols vstp vlan vlan-id interface interface-name]  
user@host# set edge
```

Edge ports do not expect to receive bridge protocol data unit (BPDU) packets. If a BPDU packet is received for an edge port, the port becomes a nonedge port

You can also enable BPDU root protection for all spanning-tree protocol instances on the interface. BPDU root protect ensures the port is the spanning-tree designated port. If the port receives superior BPDU packets, root protect moves this port to a root-prevented spanning-tree state. For configuration details, see [“Checking the Status of Spanning-Tree Instance Interfaces” on page 105](#).

9. Verify the VSTP configuration:

```
[edit]  
... { # Optional logical system and/or routing instance  
  protocols (STP Type) {  
    vstp {
```



```

force-version stp; # Optional.
interface interface-name {
    priority interface-priority;
    cost interface-link-cost; # Optional.
    mode (p2p | shared);
    edge; # Optional.
}
vlan vlan-id {
    bridge-priority bridge-priority;
    max-age seconds;
    hello-time seconds;
    forward-delay seconds; # Optional.
    interface interface-name {
        priority interface-priority;
        cost interface-link-cost; # Optional.
        mode (p2p | shared);
        edge; # Optional.
    }
}
}
}
}

```

Related Documentation

- [Spanning-Tree Protocols Supported on page 4](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 49](#)
- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 52](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology on page 9](#)

Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior

To configure VPLS root protection topology change actions to control global spanning tree behavior:

1. Enable configuration of the spanning-tree protocol:

```

[edit]
user@host# edit protocols (STP Type) (mstp | rstp | vstp)

```

2. (Optional) Change the priority of the backup bridge in a VPLS multihomed Layer 2 ring with MPLS infrastructure:

```

[edit protocols (rstp | mstp | vstp)]
user@host# set backup-bridge-priority vpls-ring-backup-bridge-priority

```

3. (Optional) Change number of seconds to hold before switching to the primary priority when the first core domain comes up:

```

[edit protocols (rstp | mstp | vstp)]
user@host# set priority-hold-time seconds

```

4. Configure the system identifier for bridges in the ring:

```

[edit protocols (rstp | mstp | vstp)]

```

```
user@host# set system-id system-id-value bridge-host-ip-address(es)
```

The **system-id-value** is configured in the format *nnnnnn:nnnnnn*, where *n* = any digit from 0 to 9.

Each **bridge-host-ip-address** is a valid host IP address with a /32 mask.



NOTE: There are no default values for the system identifier or host IP addresses.

5. Configure bridges to flush the MAC address cache (of the MAC addresses learned when other interfaces ports were blocked) when the spanning-tree topology changes:

```
[edit protocols (rstp | mstp | vstp)]
```

```
user@host# set vpls-flush-on-topology-change
```

6. Verify the configuration of VPLS root protection topology change actions to control global spanning tree behavior:

```
[edit]
protocols {
  (mstp | rstp | vstp) {
    backup-bridge-priority priority; # Default is 32,768.
    priority-hold-time seconds; # Default is 2 seconds.
    system-id system-id-value {
      ip-address;
    }
    vpls-flush-on-topology-change;
  }
}
```

Related Documentation

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology on page 9](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior on page 62](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

BPDU Protection for Individual Spanning-Tree Instance Interfaces

To configure BPDU protection on one or more spanning-tree instance interfaces, include the **bpdud-block** statement:

```
bpdud-block {
  interface interface-name;
  disable-timeout seconds;
}
```



NOTE: If you also include the optional **disable-timeout seconds** statement, **blocked interfaces** are automatically cleared after the specified time interval unless the interval is 0.

- Related Documentation**
- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
 - [Configuring BPDU Protection on Individual Interfaces on page 61](#)

Configuring Loop Protection for a Spanning-Tree Instance Interface

Before you begin, you must fully configure the spanning-tree protocol, including instance interfaces. You can configure RSTP, MSTP, or VSTP at the following hierarchy levels:

- **[edit protocols]**
- **[edit routing-instances *routing-instance-name* protocols]**

To configure enhanced loop protection:

1. Include the **bpdu-timeout-action** statement with either the **block** or **log** option for the spanning-tree protocol interface.

- For the STP or RSTP instance on a physical interface:

```
[edit]
protocols {
  rstp {
    interface interface-name {
      bpdu-timeout-action (log | block);
    }
  }
}
```

- For all MSTP instances on a physical interface:

```
[edit]
protocols {
  mstp {
    interface interface-name {
      bpdu-timeout-action (log | block);
    }
  }
}
```

- For all VSTP instances on a physical interface configured at the global level or a the VLAN level:

```
[edit]
protocols {
  vstp {
    interface interface-name {
      bpdu-timeout-action (log | block);
    }
    vlan vlan-id {
      interface interface-name {
        bpdu-timeout-action (log | block);
      }
    }
  }
}
```

```
}  
}
```

2. To display the spanning-tree protocol loop protection characteristics on an interface, use the **show spanning-tree interface** operational command.

Related Documentation

- [Loop Protection for Spanning-Tree Instance Interfaces Overview on page 6](#)
- [Loop Protection for a Spanning-Tree Instance Interface on page 19](#)
- [Example: Enabling Loop Protection for Spanning-Tree Protocols on page 27](#)

Enabling Root Protect for a Spanning-Tree Instance Interface

To enable root protect for a spanning-tree instance interface:

1. Enable configuration of the spanning-tree protocol:

```
[edit]  
user@host# edit protocols (mstp | rstp | vstp <vlan vlan-id>)
```

2. Enable configuration of the spanning-tree instance interface:

```
[edit ... protocols (mstp | rstp | vstp <vlan vlan-id>)]  
user@host# edit interface interface-name
```

3. Enable root protection on the interface:

```
[edit ... protocols (mstp | rstp | vstp <vlan vlan-id>) interface interface-name]  
user@host# set no-root-port
```

4. Verify the configuration of root protect for the spanning-tree instance interface:

```
[edit ... protocols (mstp | rstp | vstp <vlan vlan-id>) interface interface-name]  
user@host# top  
user@host# show ... protocols
```

```
...  
(mstp | rstp | vstp <vlan vlan-id>) {  
  interface interface-name {  
    no-root-port;  
  }  
}
```



NOTE: This is not a complete configuration.

Related Documentation

- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [Root Protect for a Spanning-Tree Instance Interface on page 19](#)

Configuring BPDU Protection on Individual Interfaces

On MX Series routers and EX Series switches, you can configure BPDU protection to ignore BPDU received on interfaces where none should be expected. If a BPDU is received on a blocked interface, the interface is disabled and stops forwarding frames. By default, all BPDUs are accepted and processed on all interfaces.

To configure BPDU protection for individual spanning-tree instance interfaces:

1. Enable BPDU protection on a specific spanning-tree instance interface:

```
[edit]
user@host# edit protocols layer2-control bpd-block
user@host# set interface interface (aex | (ge-fpc/pic/port | xe-fpc/pic/port))
```

If a BPDU is received on the interface, the system will disable the interface and stop forwarding frames out the interface until the bridging process is restarted.

2. (Optional) Configure the amount of time the system waits before *automatically* unblocking this interface after it has received a BPDU.

```
[edit protocols layer2-control bpd-block interface interface-name]
user@host# set disable-timeout seconds
```

The range of the *seconds* option value is from 10 through 3600 seconds (one hour). A *seconds* option value of 0 is allowed, but this results in the default behavior (the interface is blocked until the interface is cleared).

3. Verify the configuration of BPDU blocking for individual interfaces:

```
[edit]
interfaces {
  ge-fpc/pic/port { # VLAN encapsulation on Gigabit Ethernet.
    encapsulation (ethernet-bridge | extended-vlan-bridge | extended-vlan-vpls |
      vlan-vpls);
  }
  xe-fpc/pic/port { # VLAN encapsulation on 10-Gigabit Ethernet.
    encapsulation (ethernet-bridge | extended-vlan-bridge | extended-vlan-vpls |
      vlan-vpls);
  }
  ae-X { # VLAN encapsulation
    encapsulation (ethernet-vpls vlan-vpls); # on Aggregated Ethernet.
    ...
  }
  ae-X { # Extended VLAN encapsulation
    vlan-tagging; # on Aggregated Ethernet.
    encapsulation extended-vlan-vpls;
    unit logical-unit-number {
      vlan-id number;
      .....
    }
    .....
  }
}
protocols
  layer2-control {
    bpd-block
```

```
interface interface-name;  
  disable-timeout seconds;  
}  
}
```

**Related
Documentation**

- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20](#)

Configuring BPDU Protection on All Edge Ports

On MX Series routers and EX Series switches, you can configure BPDU protection to ignore BPDU received on interfaces where none should be expected. If a BPDU is received on a blocked interface, the interface is disabled and stops forwarding frames. By default, all BPDUs are accepted and processed on all interfaces.

To configure BPDU protection for all edge ports for a particular spanning-tree protocol::

1. Enable edge port blocking for a particular spanning-tree protocol:

```
[edit]  
user@host# set protocols (STP Type) (mstp | rstp | vstp) bpdu-block-on-edge
```

2. Verify BPDU protection for edge ports.

```
[edit]  
protocols (STP Type) {  
  (mstp | rstp | vstp) {  
    bpdu-block-on-edge;  
  }  
}
```

**Related
Documentation**

- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection on All Edge Ports of the Bridge on page 20](#)

Configuring VPLS Root Protection Topology Change Actions to Control VLAN Spanning Tree Behavior

To configure VPLS root protection topology change actions to control a particular VLAN:

1. Enable configuration of the spanning-tree protocol VLAN:

```
[edit]  
user@host# edit protocols (STP Type) vstp vlan vlan-id
```

2. Optional) Change the priority of the backup bridge in a VPLS multihomed Layer 2 ring with MPLS infrastructure:

```
[edit protocols vstp vlan vlan-id]  
user@host# set backup-bridge-priority vpls-ring-backup-bridge-priority
```

- (Optional) Change the hold time before switching to the primary priority when the first core domain comes up:

```
[edit protocols vstp vlan vlan-id]
user@host# set priority-hold-time seconds
```

- Configure the system identifier for bridges in the ring:

```
[edit protocols vstp vlan vlan-id]
user@host# set system-id system-id-value bridge-host-ip-address(es)
```

The **system-id-value** is configured in the format *nnnnnn:nnnnnn*, where *n* = any digit from 0 to 9.

Each **bridge-host-ip-address** is a valid host IP address with a /32 mask.



NOTE: There are no default values for the system identifier or host IP addresses.

- Configure bridges to flush the MAC address cache (of the MAC addresses learned when other interfaces ports were blocked) when the spanning-tree topology changes:

```
[edit protocols vstp vlan vlan-id]
user@host# set vpls-flush-on-topology-change
```

- Verify the configuration of VPLS root protection topology change actions to control a particular VLAN:

```
[edit]
protocols {
  vstp {
    vlan vlan-id {
      backup-bridge-priority priority; # Default is 32,768.
      priority-hold-time seconds; # Default is 2 seconds.
      system-id system-id-value {
        ip-address;
      }
      vpls-flush-on-topology-change;
    }
  }
}
```

Related Documentation

- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology on page 9](#)
- [Configuring VPLS Root Protection Topology Change Actions to Control Global Spanning Tree Behavior on page 57](#)
- [Example: Configuring VPLS Root Topology Change Actions on page 28](#)

Configuring Layer 2 Protocol Tunneling

To configure Layer 2 protocol tunneling:

1. Enable MAC address rewriting for Layer 2 protocol tunneling:

```
[edit]
user@host# edit protocols layer2-control mac-rewrite
```

2. Configure the Layer 2 protocol tunnel interface:

```
[edit ... protocols layer2-control mac-rewrite]
user@host# edit interface ge-fpc/pic/port
```

3. Configure the Layer 2 protocol to be tunneled:

```
[edit protocols layer2-control mac-rewrite interface ge-fpc/pic/port]
user@host# set protocol (cdp | stp | vtp)
```

4. Verify the configuration:

```
user@host# show protocols
layer2-control {
  mac-rewrite {
    interface ge-fpc/pic/port {
      protocol (cdp | stp | vtp);
    }
  }
}
```

Related Documentation

- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
- [Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 106](#)
- [Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 107](#)

CHAPTER 4

Configuration Statements

- [\[edit protocols mstp\] Hierarchy Level on page 65](#)
- [\[edit protocols rstp\] Hierarchy Level on page 66](#)
- [\[edit protocols vstp\] Hierarchy Level on page 67](#)
- [\[edit protocols layer2-control\] Hierarchy Level on page 92](#)
- [\[edit protocols layer2-control\] Hierarchy Level on page 99](#)

[\[edit protocols mstp\] Hierarchy Level](#)

The following statement hierarchy can also be included at the [\[edit logical-systems *logical-system-name*\]](#) hierarchy level.

```
protocols {
  mstp {
    disable;
    backup-bridge-priority priority;
    bpdu-block-on-edge;
    bpdu-destination-mac-address provider-bridge-group;
    bridge-priority priority;
    configuration-name configuration-name;
    forward-delay seconds;
    hello-time seconds;
    interface interface-name {
      bpdu-timeout-action {
        alarm;
        block;
      }
      cost cost;
      edge;
      mode (point-to-point | shared);
      no-root-port;
      priority interface-priority;
    }
    max-age seconds;
    max-hops hops;
    msti identifier {
      backup-bridge-priority priority;
      bridge-priority priority;
      interface interface-name {
        cost cost;
      }
    }
  }
}
```

```
    priority interface-priority;
  }
  vlan [ vlan-ids ];
}
priority-hold-time seconds;
revision-level revision-level;
system-id mac-address {
  ip-address ip-address</prefix-length>;
}
traceoptions {
  file filename <files number> <size maximum-file-size> <world-readable |
    no-world-readable>;
  flag flag <disable>;
}
vpls-flush-on-topology-change;
}
```

- Related Documentation**
- Notational Conventions Used in Junos OS Configuration Hierarchies
 - [edit protocols] Hierarchy Level

[edit protocols rstp] Hierarchy Level

The following statement hierarchy can also be included at the [edit logical-systems *logical-system-name*] hierarchy level.

```
protocols {
  rstp {
    disable;
    backup-bridge-priority priority;
    bpdu-block-on-edge;
    bpdu-destination-mac-address provider-bridge-group;
    bridge-priority priority;
    extended-system-id id;
    force-version stp;
    forward-delay seconds;
    hello-time seconds;
    interface interface-name {
      bpdu-timeout-action {
        alarm;
        block;
      }
      cost cost;
      edge;
      mode (point-to-point | shared);
      no-root-port;
      priority interface-priority;
    }
    max-age seconds;
    priority-hold-time seconds;
    system-id mac-address {
      ip-address ip-address</prefix-length>;
    }
    traceoptions {
```

```

        file filename <files number> <size maximum-file-size> <world-readable |
        no-world-readable>;
        flag flag <disable>;
    }
    vpls-flush-on-topology-change;
}

```

**Related
Documentation**

- Notational Conventions Used in Junos OS Configuration Hierarchies
- [edit protocols] Hierarchy Level

[edit protocols vstp] Hierarchy Level

The following statement hierarchy can also be included at the [edit logical-systems *logical-system-name*] hierarchy level.

```

protocols {
  vstp {
    disable;
    bpdu-block-on-edge;
    force-version stp;
    interface interface-name {
      access-trunk
      bpdu-timeout-action {
        alarm;
        block;
      }
      cost cost;
      edge;
      mode (point-to-point | shared);
      no-root-port;
      priority interface-priority;
    }
    priority-hold-time seconds;
    system-id mac-address {
      ip-address ip-address </prefix-length>;
    }
    vlan vlan-id {
      ... the vlan subhierarchy appears after the main [edit protocols vstp] hierarchy level ...
    }
    vpls-flush-on-topology-change;
  }

  vstp {
    vlan vlan-id {
      backup-bridge-priority priority;
      bridge-priority priority;
      forward-delay seconds;
      hello-time seconds;
      interface interface-name {
        ... same statements as at the [edit protocols vstp interface interface-name] hierarchy
        level ...
      }
      max-age seconds;
    }
  }
}

```

```
    traceoptions {  
        file filename <files number> <size maximum-file-size> <world-readable |  
            no-world-readable>;  
        flag flag <disable>;  
    }  
}  
}
```

- Related Documentation**
- Notational Conventions Used in Junos OS Configuration Hierarchies
 - [edit protocols] Hierarchy Level

protocols (STP Type)

Syntax	<pre>protocols { mstp { ... } rstp { ... } vstp { ... } }</pre>
Hierarchy Level	[edit], [edit logical-systems <i>logical-system-name</i>], [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.
Description	Configure the Spanning Tree Protocol type as MSTP, RSTP, or VSTP.
Options	mstp —Configure the protocol as Multiple Spanning Tree. rstp —Configure the protocol as Rapid Spanning Tree. vstp —Configure the protocol as VLAN Spanning Tree.
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 Rapid Spanning-Tree Protocol on page 50• Configuring Multiple Spanning-Tree Protocol on page 44• Configuring VLAN Spanning-Tree Protocol on page 54

access-trunk

Syntax	access-trunk;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols vstp] [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp] [edit protocols vstp vlan <i>vlan-identifier</i> interface <i>interface-name</i>] [edit routing-instances <i>routing-instance-name</i> instance-type (layer2-control virtual-switch)]
Description	Enable untagged RTSP BDPUs to be sent and received on the interface.
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 VSTP on a Trunk Port with Tagged Traffic on page 28

bpdu-destination-mac-address (Spanning Tree)

Syntax	bpdu-destination-mac-address provider-bridge-group;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp)], [edit protocols (mstp rstp)], [edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp)]
Release Information	Statement introduced in Junos OS Release 9.2. Support for logical systems added in Junos OS Release 9.6.
Description	Enable MX Series router to participate in the provider Rapid Spanning-Tree Protocol (RSTP) instance or a provider Multiple Spanning-Tree Protocol (MSTP) instance.
Default	If the bpdu-destination-mac-address statement is not configured, the bridge participates in the customer RSTP instance, transmitting and receiving standard RSTP BPDU packets.
Options	provider-bridge-group —The destination MAC address of the BPDU packets transmitted is the provider bridge group address 01:80:c2:00:00:08 . Received BPDU packets with this destination MAC address are accepted and passed to the Routing Engine.
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"> • BPDU Overview on page 5 • Provider Bridge Participation in RSTP or MSTP Instances on page 49 • Configuring Rapid Spanning-Tree Protocol on page 50 • Configuring Multiple Spanning-Tree Protocol on page 44

configuration-name

Syntax	configuration-name <i>configuration-name</i> ;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols mstp], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp], [edit protocols mstp], [edit routing-instances <i>routing-instance-name</i> protocols mstp]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	The configuration name is the MSTP region name carried in the MSTP BPDUs.
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">• BPDU Overview on page 5• Configuring Multiple Spanning-Tree Protocol on page 44

cost

Syntax	<code>cost cost;</code>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp <i>msti</i> <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <i>vlan</i> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp <i>msti</i> <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan</i> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp <i>msti</i> <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols vstp <i>vlan</i> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp <i>msti</i> <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan</i> <i>vlan-id</i> interface <i>interface-name</i>]</p>
Release Information	<p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Configure link cost to control which bridge is the designated bridge and which port is the designated port. By default, the link cost is determined by the link speed.
Options	<p>cost—(Optional) Link cost associated with the port.</p> <p>Range: 1 through 200,000,000</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"> • Spanning-Tree Instance Interface on page 14 • Spanning-Tree Instance Interface Cost on page 15

disable

Syntax	disable;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols mstp], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp], [edit protocols mstp], [edit routing-instances <i>routing-instance-name</i> protocols mstp]
Release Information	Statement introduced in Junos OS Release 9.1. Support for logical systems added in Junos OS Release 9.6.
Description	Disable the entire MSTP 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">• Configuring Multiple Spanning-Tree Protocol on page 44• Disabling MSTP on page 48

edge

Syntax	edge;
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>]</p>
Release Information	<p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Configure interfaces as edge ports. Edge ports do not expect to receive BPDUs. If a BPDU is received, the port becomes a nonedge port.
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"> • Spanning-Tree Instance Interface on page 14 • Spanning-Tree Instance Interface Configured as an Edge Port on page 16

extended-system-id

Syntax	<code>extended-system-id <i>identifier</i>;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols rstp], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols rstp], [edit protocols rstp], [edit routing-instances <i>routing-instance-name</i> protocols rstp]
Release Information	Statement introduced in Junos OS Release 8.3. Support for logical systems added in Junos OS Release 9.6.
Description	The extended system ID is used to specify different bridge identifiers for different RSTP or STP routing instances.
Options	<i>identifier</i> —Specify the system identifier to use for the RSTP or STP instance. Range: 0 through 4095
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">• System Identifier for Bridges in STP or RSTP Instances on page 53• Configuring Rapid Spanning-Tree Protocol on page 50

force-version (IEEE 802.1D STP)

Syntax	<code>force-version stp;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols (rstp vstp)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (rstp vstp)], [edit protocols (rstp vstp)], [edit routing-instances <i>routing-instance-name</i> protocols (rstp vstp)]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Force the spanning-tree version to be the original IEEE 803.1D STP.
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">• Spanning-Tree Protocols Supported on page 4• RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 49• Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 52

forward-delay

Syntax	<code>forward-delay seconds;</code>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>]</p>
Release Information	<p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Specify the length of time an STP bridge port remains in the listening and learning states before transitioning to the forwarding state.
Options	<p>seconds—(Optional) Number of seconds the bridge port remains in the listening and learning states.</p> <p>Range: 4 through 30</p> <p>Default: 15 seconds</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"> • Forward Delay Before Ports Transition to Forwarding State on page 14

hello-time

Syntax	hello-time <i>seconds</i> ;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols (<i>mstp</i> <i>rstp</i>)], [edit logical-systems <i>logical-system-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>], [edit protocols (<i>mstp</i> <i>rstp</i>)], [edit protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>], [edit routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)], [edit routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Specify the number of seconds between transmissions of configuration BPDUs by the root bridge.
Options	<i>seconds</i> —(Optional) Number of seconds between transmissions of configuration BPDUs. Range: 1 through 10 Default: 2 seconds
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">• Hello Time for Root Bridge to Transmit Hello BPDUs on page 13

interface (Spanning Tree)

Syntax	<pre> interface <i>interface-name</i> { bpdv-timeout-action { alarm; block; } cost <i>cost</i>; edge; mode (p2p shared); no-root-port; priority <i>interface-priority</i>; } </pre>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp vstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit protocols (mstp rstp vstp)],</p> <p>[edit protocols vstp <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan</i> <i>vlan-id</i>]</p>
Release Information	<p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Configure the interface to participate in the RSTP or MSTP instance.
Options	<p><i>interface-name</i>—Name of a Gigabit Ethernet or 10-Gigabit Ethernet interface.</p> <p>The remaining statements are explained separately.</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"> • Spanning-Tree Instance Interface on page 14

max-age

Syntax	<code>max-age seconds;</code>
Hierarchy Level	<code>[edit logical-systems <i>logical-system-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</code> <code>[edit logical-systems <i>logical-system-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</code> <code>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols</code> <code> (<i>mstp</i> <i>rstp</i>)],</code> <code>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols</code> <code> <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</code> <code>[edit protocols (<i>mstp</i> <i>rstp</i>)],</code> <code>[edit protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</code> <code>[edit routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</code> <code>[edit routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>]</code>
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Specify the maximum expected arrival time of hello BPDUs.
Options	seconds —(Optional) Number of seconds expected between hello BPDUs. Range: 6 through 40 Default: 20 seconds
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">• Maximum Age for Awaiting Arrival of Hello BPDUs on page 13

max-hops

Syntax	<code>max-hops hops;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols mstp], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp], [edit protocols mstp], [edit routing-instances <i>routing-instance-name</i> protocols mstp]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Configure the maximum number of hops a BPDU can be forwarded in the MSTP region.
Options	hops —(Optional) Number of hops the BPDU can be forwarded. Range: 1 through 255 Default: 19 hops
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 Multiple Spanning-Tree Protocol on page 44

mode (Protocols STP)

Syntax	<code>mode (p2p shared);</code>
Hierarchy Level	<code>[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</code> <code>[edit logical-systems <i>logical-system-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</code> <code>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</code> <code>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</code> <code>[edit protocols (mstp rstp vstp) interface <i>interface-name</i>],</code> <code>[edit protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</code> <code>[edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</code> <code>[edit routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>]</code>
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Configure link mode to identify point-to-point links.
Default	When the link is configured as full-duplex, the default link mode is p2p . When the link is configured half-duplex, the default link mode is shared .
Options	p2p —The link is point to point. shared —The link is shared media.
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">• Spanning-Tree Instance Interface on page 14• Spanning-Tree Instance Interface Point-to-Point Link Mode on page 16

msti

Syntax	<pre> msti <i>msti-id</i> { bridge-priority <i>priority</i>; vlan <i>vlan-id</i>; interface <i>interface-name</i> { cost <i>cost</i>; edge; priority <i>interface-priority</i>; } } </pre>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols mstp], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp], [edit protocols mstp], [edit routing-instances <i>routing-instance-name</i> protocols mstp]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Configure the Multiple Spanning Tree Protocol (MSTI) instance identifier.
Options	<p>msti-id—MSTI instance identifier.</p> <p>Range: 1 through 64</p> <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 Multiple Spanning-Tree Protocol on page 44 • Configuring MST Instances on a Physical Interface on page 47

mstp

Syntax	<pre> mstp { bpdv-block-on-edge; bridge-priority <i>priority</i>; configuration-name <i>configuration-name</i>; disable; forward-delay <i>seconds</i>; hello-time <i>seconds</i>; max-age <i>seconds</i>; max-hops <i>hops</i>; priority-hold-time <i>seconds</i>; revision-level <i>revision-level</i>; interface <i>interface-name</i> { bpdv-timeout-action { alarm; block; } cost <i>cost</i>; edge; mode (p2p shared); no-root-port; priority <i>interface-priority</i>; } msti <i>msti-id</i> { bridge-priority <i>priority</i>; interface <i>interface-name</i> { cost <i>cost</i>; edge; priority <i>interface-priority</i>; } vlan <i>vlan-id</i>; } traceoptions { file <i>filename</i> <files <i>number</i>> <size <i>size</i>> <world-readable no-world-readable>; flag <i>flag</i> <flag-modifier> <disable>; } } </pre>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols],</p> <p>[edit protocols],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols]</p>
Release Information	<p>Statement introduced in Junos OS Release 8.4.</p> <p>bpdv-block-on-edge statement added in Junos OS Release 9.4.</p> <p>bpdv-timeout-action statement added in Junos OS Release 9.4.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Configure MSTP parameters.
Options	The statements are explained separately.

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

Related Documentation

- [Configuring Multiple Spanning-Tree Protocol on page 44](#)

priority (Protocols STP)

Syntax `priority interface-priority;`

Hierarchy Level [edit logical-systems *logical-system-name* protocols (**mstp** | **rstp** | **vstp**) **interface** *interface-name*],
[edit logical-systems *logical-system-name* protocols **mstp msti msti-id** **interface** *interface-name*],
[edit logical-systems *logical-system-name* protocols **vstp vlan vlan-id** **interface** *interface-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols (**mstp** | **rstp** | **vstp**) **interface** *interface-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols **mstp msti msti-id** **interface** *interface-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols **vstp vlan vlan-id** **interface** *interface-name*],
[edit protocols (**mstp** | **rstp** | **vstp**) **interface** *interface-name*],
[edit protocols **mstp msti msti-id** **interface** *interface-name*],
[edit protocols **vstp vlan vlan-id** **interface** *interface-name*],
[edit routing-instances *routing-instance-name* protocols (**mstp** | **rstp** | **vstp**) **interface** *interface-name*],
[edit routing-instances *routing-instance-name* protocols **mstp msti msti-id** **interface** *interface-name*],
[edit routing-instances *routing-instance-name* protocols **vstp vlan vlan-id** **interface** *interface-name*]

Release Information Statement introduced in Junos OS Release 8.4.
Support for logical systems added in Junos OS Release 9.6.

Description Use the interface priority to control which interface is elected as the root port. The interface priority must be set in increments of 16.

Options *priority*—(Optional) Interface priority.
Range: 0 through 240

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

Related Documentation

- [Spanning-Tree Instance Interface on page 14](#)
- [Spanning-Tree Instance Interface Configured as an Edge Port on page 16](#)
- [Spanning-Tree Instance Interface Priority on page 15](#)

revision-level

Syntax	<code>revision-level <i>revision-level</i>;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols mstp], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp], [edit protocols mstp], [edit routing-instances <i>routing-instance-name</i> protocols mstp]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Set the revision number of the MSTP configuration.
Options	<i>revision-level</i> —Configure the revision number of the MSTP region configuration. Range: 0 through 65,535
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 Multiple Spanning-Tree Protocol on page 44

rstp

Syntax	<pre> rstp { bpd-block-on-edge; bpd-destination-mac-address provider-bridge-group; bridge-priority priority; extended-system-id; force-version stp; forward-delay seconds; hello-time seconds; max-age seconds; interface interface-name { bpd-timeout-action { alarm; block; } cost cost; edge; mode (p2p shared); no-root-port; priority interface-priority; } priority-hold-time seconds; traceoptions { file filename <files number> <size size> <world-readable no-world-readable>; flag flag <flag-modifier> <disable>; } } </pre>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols],</p> <p>[edit protocols],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols]</p>
Release Information	<p>Statement introduced in Junos OS Release 8.4.</p> <p>bpd-block-on-edge statement added in Junos OS Release 9.4.</p> <p>bpd-timeout-action statement added in Junos OS Release 9.4.</p> <p>Support for logic systems added in Junos OS Release 9.6.</p>
Description	Configure RSTP parameters.
Options	The statements are explained separately.
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"> • Configuring Rapid Spanning-Tree Protocol on page 50

traceoptions (Spanning Tree)

Syntax	<pre>traceoptions { file <i>filename</i> <files <i>number</i>> <size <i>size</i>> <world-readable no-world-readable>; flag <i>flag</i> <flag-modifier> <disable>; }</pre>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp vstp)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp)], [edit protocols (mstp rstp vstp)], [edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp)]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Set STP protocol-level tracing options.
Default	The default STP protocol-level trace options are inherited from the global traceoptions statement.
Options	<p>disable—(Optional) Disable the tracing operation. One use of this option is to disable a single operation when you have defined a broad group of tracing operations, such as all.</p> <p>file <i>filename</i>—Name of the file to receive the output of the tracing operation. Enclose the name in quotation marks. We recommend that you place STP tracing output in the file <code>/var/log/stp-log</code>.</p> <p>files <i>number</i>—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.</p> <p>If you specify a maximum number of files, you must also specify a maximum file size with the size option.</p> <p>Range: 2 through 1000 files Default: 1 trace file only</p> <p>flag—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. The following are the STP-specific tracing options:</p> <ul style="list-style-type: none">• all—Trace all operations.• all-failures—Trace all failure conditions.• bpdu—Trace BPDU reception and transmission.• bridge-detection-state-machine—Trace the bridge detection state machine.• events—Trace events of the protocol state machine.

- **port-information-state-machine**—Trace the port information state machine.
- **port-migration-state-machine**—Trace the port migration state machine.
- **port-receive-state-machine**—Trace the port receive state machine.
- **port-role-transit-state-machine**—Trace the port role transit state machine.
- **port-role-select-state-machine**—Trace the port role selection state machine.
- **port-state-transit-state-machine**—Trace the port state transit state machine.
- **port-transmit-state-machine**—Trace the port transmit state machine.
- **ppmd**—Trace the state and events for the ppm process.
- **state-machine-variables**—Trace when the state machine variables change.
- **timers**—Trace protocol timers.
- **topology-change-state-machine**—Trace the topology change state machine.

The following are the global tracing options:

- **all**—All tracing operations.
- **config-internal**—Trace configuration internals.
- **general**—Trace general events.
- **normal**—All normal events.

Default: If you do not specify this option, only unusual or abnormal operations are traced.

- **parse**—Trace configuration parsing.
- **policy**—Trace policy operations and actions.
- **regex-parse**—Trace regular-expression parsing.
- **route**—Trace routing table changes.
- **state**—Trace state transitions.
- **task**—Trace protocol task processing.
- **timer**—Trace protocol task timer processing.

no-world-readable—(Optional) Prevent any user from reading the log file.

size size—(Optional) Maximum size of each trace file, in kilobytes (KB) or megabytes (MB). When a trace file named **trace-file** reaches this size, it is renamed **trace-file.0**. When the **trace-file** again reaches its maximum size, **trace-file.0** is renamed **trace-file.1** and **trace-file** is renamed **trace-file.0**. This renaming scheme continues until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum file size, you must also specify a maximum number of trace files with the **files** option.

Syntax: **xk** to specify KB, **xm** to specify MB, or **xg** to specify GB

Range: 10 KB through the maximum file size supported on your system

Default: 1 MB

world-readable—(Optional) Allow any user to read the log file.

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

Related Documentation	<ul style="list-style-type: none">• Spanning-Tree Protocol Trace Options on page 17• Tracing Spanning-Tree Operations on page 107• Example: Tracing Spanning-Tree Protocol Operations on page 40
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vlan (MSTP)

Syntax	<code>vlan <i>vlan-id</i>;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols mstp <i>msti msti-id</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp <i>msti msti-id</i>], [edit protocols mstp <i>msti msti-id</i>], [edit routing-instances <i>routing-instance-name</i> protocols mstp <i>msti msti-id</i>]
Release Information	Statement introduced in Junos OS Release 8.4. Support for logical systems added in Junos OS Release 9.6.
Description	Configure the VLAN of an MSTI or VSTP instance or configure the VLAN range of an MSTI instance.
Options	<i>vlan-id</i> —The VLAN identifier associated with the MSTI. <i>vlan-id-range</i> —Range of VLAN identifiers associated with the MSTI in the form <i>minimum-vlan-id-maximum-vlan-id</i> . VLAN identifier ranges are not supported for VSTP. Range: 1 through 4096
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 Multiple Spanning-Tree Protocol on page 44

vlan (VSTP)

Syntax	<pre>vlan <i>vlan-id</i> { bridge-priority <i>priority</i>; forward-delay <i>seconds</i>; hello-time <i>seconds</i>; max-age <i>seconds</i>; interface <i>interface-name</i> { cost <i>cost</i>; edge; mode (p2p shared); no-root-port; priority <i>interface-priority</i>; } }</pre>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols vstp], [edit protocols vstp]
Release Information	Statement introduced in Junos OS Release 9.0. Support for logical systems added in Junos OS Release 9.6.
Description	Configure VSTP VLAN parameters.
Options	The statements are explained separately.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring VLAN Spanning-Tree Protocol on page 54

vstp

```
Syntax  vstp {
        bpd-block-on-edge;
        force-version stp;
        interface interface-name {
            bpd-timeout-action {
                alarm;
                block;
            }
            cost cost;
            edge;
            mode (p2p | shared);
            no-root-port;
            priority interface-priority;
        }
        priority-hold-time seconds;
        vlan vlan-id {
            bridge-priority priority;
            forward-delay seconds;
            hello-time seconds;
            max-age seconds;
            interface interface-name {
                access-trunk
                bpd-timeout-action {
                    alarm;
                    block;
                }
                cost cost;
                edge;
                mode (p2p | shared);
                no-root-port;
                priority interface-priority;
            }
        }
        traceoptions {
            file filename <files number> <size size> <world-readable | no-world-readable>;
            flag flag <flag-modifier> <disable>;
        }
    }
```

Hierarchy Level [edit logical-systems *logical-system-name* protocols],
 [edit logical-systems *logical-system-name* routing-instances *routing-instance-name*
 protocols],
 [edit protocols],
 [edit routing-instances *routing-instance-name* protocols]

Release Information Statement introduced in Junos OS Release 9.0.
bpd-block-on-edge statement added in Junos OS Release 9.4.
bpd-timeout-action statement added in Junos OS Release 9.4.
 Support for logical systems added in Junos OS Release 9.6.

Description Configure VSTP parameters.

Options	The statements are explained separately.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring VLAN Spanning-Tree Protocol on page 54

[edit protocols layer2-control] Hierarchy Level

The following statement hierarchy can also be included at the [edit logical-systems *logical-system-name*] hierarchy level.

```
protocols {
  layer2-control {
    bpdu-block {
      disable-timeout seconds;
      interface [ interface-names ];
    }
    mac-rewrite {
      interface interface-name {
        protocol {
          cdp;
          stp;
          vtp;
        }
      }
    }
  }
  nonstop-bridging;
  traceoptions {
    file filename <files number> <size maximum-file-size> <world-readable |
      no-world-readable>;
    flag flag <disable>;
  }
}
```

Related Documentation	<ul style="list-style-type: none">• Notational Conventions Used in Junos OS Configuration Hierarchies• [edit protocols] Hierarchy Level
------------------------------	--

interface (Layer 2 Protocol Tunneling)

Syntax	<code>interface <i>interface-name</i> { <code>protocol</code> (cdp stp vtp); }</code>
Hierarchy Level	[edit protocols <code>layer2-control mac-rewrite</code>]
Release Information	Statement introduced in Junos OS Release 9.1.
Description	<p>Configure an interface for Layer 2 protocol tunneling.</p> <p>The remaining statement is described 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">• Layer 2 Protocol Tunneling Through a Network Overview on page 10

layer2-control

Syntax

```
layer2-control {  
  bpd-block {  
    interface interface-name;  
    disable-timeout seconds;  
  }  
  mac-rewrite {  
    interface interface-name {  
      protocol (cdp | stp | vtp);  
    }  
  }  
  nonstop-bridging;  
}
```

Hierarchy Level [edit protocols]

Release Information Statement introduced in Junos OS Release 8.4.
bpd-block statement added in Junos OS Release 9.4.

Description Configure Layer 2 control protocols to enable features such as Layer 2 protocol tunneling or nonstop bridging.

The remaining statements are described separately.



NOTE: For a detailed description of configuring the nonstop-bridging statement, see the Junos OS High Availability Configuration Guide. When this statement is configured on routing platforms with two Routing Engines, a master Routing Engine switches over gracefully to a backup Routing Engine and preserves Layer 2 Control Protocol (L2CP) information.

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

Related Documentation

- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
- [Layer 2 Protocol Tunnel Interface on page 18](#)
- [Layer 2 Protocol to be Tunneled on page 18](#)
- [Configuring Layer 2 Protocol Tunneling on page 64](#)
- instance-type

mac-rewrite

Syntax	<pre>mac-rewrite { interface <i>interface-name</i> { protocol (cdp stp vtp); } }</pre>
Hierarchy Level	[edit protocols layer2-control]
Release Information	Statement introduced in Junos OS Release 9.1.
Description	<p>Enable rewriting of the MAC address for Layer 2 protocol tunneling.</p> <p>The remaining statements are described 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"> • Layer 2 Protocol Tunneling Through a Network Overview on page 10

protocol

Syntax	protocol (cdp stp vtp);
Hierarchy Level	[edit protocols layer2-control mac-rewrite interface <i>interface-name</i>],
Release Information	Statement introduced in Junos OS Release 9.1.
Description	Configure the protocol to be tunneled on an interface for Layer 2 protocol tunneling. To tunnel multiple protocols, include multiple protocol statements.
Options	<p>cdp—Tunnel the Cisco discovery protocol.</p> <p>stp—Tunnel all versions of the spanning-tree protocol.</p> <p>vtp—Tunnel the VLAN trunk protocol.</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"> • Layer 2 Protocol Tunneling Through a Network Overview on page 10 • Layer 2 Protocol Tunnel Interface on page 18 • Layer 2 Protocol to be Tunneled on page 18 • Configuring Layer 2 Protocol Tunneling on page 64

no-root-port

Syntax	no-root-port;
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i> interface <i>interface-name</i>]</p>
Release Information	<p>Statement introduced in Junos OS Release 9.1.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Ensure the port is the spanning-tree designated port. If the port receives superior bridge protocol data unit (BPDU) packets, root protect moves this port to a root-prevented spanning-tree state.
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">• Root Protection for Spanning-Tree Instance Interfaces Overview on page 7• Root Protect for a Spanning-Tree Instance Interface on page 19• Enabling Root Protect for a Spanning-Tree Instance Interface on page 60

priority-hold-time

Syntax	<code>priority-hold-time <i>seconds</i>;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp)], [edit protocols (mstp rstp)], [edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp)],
Release Information	Statement introduced in Junos OS Release 10.0.
Description	Specify the number of seconds to hold before switching to the primary priority when the first core domain comes up.
Options	<i>seconds</i> —Number of seconds to hold before switching to primary priority. Range: 1 through 255 Default: 2 seconds
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"> • VPLS Multihoming: Hold Time Before Switching to Primary Priority on page 21

system-id

Syntax	<code>system-id system-id-value { ip-address(es); }</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp)], [edit logical-systems <i>logical-system-name</i> protocols vstp vlan <i>vlan-id</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i>], [edit protocols (mstp rstp)], [edit protocols vstp vlan <i>vlan-id</i>], [edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp)], [edit routing-instances <i>routing-instance-name</i> protocols vstp vlan <i>vlan-id</i>]
Release Information	Statement introduced in Junos OS Release 10.0.
Description	Determine the system identifier value for bridges in a VPLS multihomed Layer 2 ring with MPLS infrastructure.
Options	<p><i>system-id-value</i>—System identifier in the format <i>nnnnnn:nnnnnn</i> where <i>n</i> = any digit from 0 through 9.</p> <p>Range: Any valid value</p> <p>Default: None</p> <p><i>ip-address(es)</i>—Valid IP host addresses in the format <i>ip-address/32</i>.</p> <p>Range: Any valid IP address</p> <p>Default: None</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">• VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview on page 8• VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology on page 9• VPLS Multihoming: System Identifier for Bridges in the Ring on page 22

vpls-flush-on-topology-change

Syntax	vpls-flush-on-topology-change;
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<i>mstp</i> <i>rstp</i>)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>]</p>
Release Information	Statement introduced in Junos OS Release 10.0.
Description	Determine the action the bridge should take when the topology of a multihomed Layer 2 ring with MPLS infrastructure changes: flush the media access control (MAC) cache or not. By default, the bridge does not flush the cache when the topology changes.
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"> • VPLS Multihoming: Bridge Flush of MAC Cache on Topology Change on page 23

[edit protocols layer2-control] Hierarchy Level

The following statement hierarchy can also be included at the [edit logical-systems *logical-system-name*] hierarchy level.

```

protocols {
  layer2-control {
    bpdu-block {
      disable-timeout seconds;
      interface [ interface-names ];
    }
    mac-rewrite {
      interface interface-name {
        protocol {
          cdp;
          stp;
          vtp;
        }
      }
    }
  }
  nonstop-bridging;
  traceoptions {
    file filename <files number> <size maximum-file-size> <world-readable |
      no-world-readable>;
    flag flag <disable>;
  }
}

```

```
}  
}
```

**Related
Documentation**

- [Notational Conventions Used in Junos OS Configuration Hierarchies](#)
- [\[edit protocols\] Hierarchy Level](#)

bpdu-block

Syntax bpdu-block {
 [interface](#) *interface-name*;
 [disable-timeout](#) *seconds*;
 }

Hierarchy Level [\[edit protocols layer2-control \]](#)

Release Information Statement introduced in Junos OS Release 9.4.

Description Enable BPDU blocking on an interface.

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**

- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20](#)
- [Configuring BPDU Protection on Individual Interfaces on page 61](#)

disable-timeout

Syntax	<code>disable-timeout <i>seconds</i>;</code>
Hierarchy Level	[edit protocols layer2-control bpdud-block]
Release Information	Statement introduced in Junos OS Release 9.4.
Description	Configure the timeout value to periodically check to see if an interface is still disabled with BPDU blocking. If this option is not configured, the interface is not periodically checked and remains disabled.
Options	<p><i>seconds</i>—Disable timeout value.</p> <p>Range: 10 through 3600</p> <p>Default: If this option is not configured, the interface is not periodically checked and remains disabled.</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"> • BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7 • BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20

interface (BPDU Blocking)

Syntax	<code>interface <i>interface-name</i>;</code>
Hierarchy Level	[edit protocols layer2-control bpdud-block]
Release Information	Statement introduced in Junos OS Release 9.4.
Description	Configure the interface to participate in BPDU blocking.
Options	<i>interface-name</i> —Name of a Gigabit Ethernet or 10-Gigabit Ethernet interface.
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"> • BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7 • BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20 • Configuring BPDU Protection on Individual Interfaces on page 61

interface (Layer 2 Protocol Tunneling)

Syntax	interface <i>interface-name</i> { <code>protocol</code> (cdp stp vtp); }
Hierarchy Level	[edit protocols <code>layer2-control mac-rewrite</code>]
Release Information	Statement introduced in Junos OS Release 9.1.
Description	Configure an interface for Layer 2 protocol tunneling. The remaining statement is described separately.
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">• Layer 2 Protocol Tunneling Through a Network Overview on page 10

PART 3

Administration

- [Routine Monitoring on page 105](#)
- [Operational Commands on page 111](#)

CHAPTER 5

Routine Monitoring

- [Checking the Status of Spanning-Tree Instance Interfaces on page 105](#)
- [Clearing the Blocked Status of a Spanning-Tree Instance Interface on page 106](#)
- [Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 106](#)
- [Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 107](#)
- [Tracing Spanning-Tree Operations on page 107](#)

Checking the Status of Spanning-Tree Instance Interfaces

On an MX Series router with a spanning-tree protocol enabled, the detection of a possible bridging loop from spanning-tree protocol operation can raise a bridge protocol data unit (BPDU) error condition on the affected spanning-tree instance interface.

To check whether a spanning-tree instance interface is blocked due to a BPDU error condition:

1. To check the status of spanning-tree instance interface, use the **show interfaces** command.

```
user@host> show interfaces interface-name
```

2. You can determine the status of the interface as follows:
 - If the **BPDU Error** field is **none**, the interface is enabled.
 - If the **BPDU Error** field is **Detected** and the link is **down**, the interface is blocked.

Related Documentation

- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20](#)
- [BPDU Protection on All Edge Ports of the Bridge on page 20](#)
- [Clearing the Blocked Status of a Spanning-Tree Instance Interface on page 106](#)

Clearing the Blocked Status of a Spanning-Tree Instance Interface

To clear the blocked status of a spanning-tree instance interface:

- Use the **clear error bpdu** operational mode command.

```
user@host> clear error bpdu interface interface-name
```



NOTE: When you configure BPDU protection on individual interfaces (as opposed to on all the edge ports of the bridge), you can use the **disable-timeout seconds** option to specify that a blocked interface is automatically cleared after the specified time interval elapses (unless the interval is 0). For configuration details, see “[Configuring BPDU Protection on Individual Interfaces](#)” on page 61.

Related Documentation

- [Root Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview on page 7](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces on page 20](#)
- [BPDU Protection on All Edge Ports of the Bridge on page 20](#)
- [Checking the Status of Spanning-Tree Instance Interfaces on page 105](#)

Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface

To check whether a spanning-tree instance interface is blocked due to a MAC rewrite error condition:

1. Use the **show interfaces** operational mode command:

```
user@host> show interfaces interface-name
```

2. You can determine the status of the interface as follows:

- If the value in the **Physical interface** includes **Enabled, Physical link is Up** and the value of the **BPDU Error** field is **None**, the interface is enabled
- If the value in the **Physical interface** field is **Enabled, Physical link is Down** and the value in the **BPDU Error** field is **Detected**, the interface is blocked.

Related Documentation

- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
- [Configuring Layer 2 Protocol Tunneling on page 64](#)
- [Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 107](#)

Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface

To clear the blocked status of a spanning-tree instance interface:

- Use the **clear error bpdu** operational mode command.

```
user@host> clear error bpdu interface interface-name
```

Related Documentation

- [Layer 2 Protocol Tunneling Through a Network Overview on page 10](#)
- [Configuring Layer 2 Protocol Tunneling on page 64](#)
- [Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 106](#)

Tracing Spanning-Tree Operations

You can enable global routing protocol tracing options at the **[edit routing-options] Hierarchy Level**. For general information about tracing and global tracing options, see the statement summary for the global traceoptions statement in the Junos OS Routing Protocols Configuration Guide.

In addition, you can enable STP-specific trace options at the following hierarchy levels:

- **[edit logical-systems *logical-system-name* protocols (mstp | rstp | vstp)]**
- **[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols (mstp | rstp | vstp)]**
- **[edit protocols (mstp | rstp | vstp)]**
- **[edit routing-instances *routing-instance-name* protocols (mstp | rstp | vstp)]**

The routing instance type can be either **virtual-switch** or **layer2-control**.

To enable tracing of spanning-tree protocol operations:

1. Enable configuration of the spanning-tree protocol whose operations are to be traced:

```
[edit]
user@host# edit ... protocols (mstp | rstp | vstp)
```

2. Enable configuration of spanning-tree protocol-specific trace options:

```
[edit ... protocols (mstp | rstp | vstp)]
user@host# edit traceoptions
```

3. Configure the files that contain trace logging information:

```
[edit ... protocols (mstp | rstp | vstp)]
user@host# set file filename <files number> <size bytes>
<world-readable | no-world-readable>
```

4. Configure spanning-tree protocol-specific options.

- a. To enable a spanning-tree protocol-specific option, include the
- flag**
- statement:

```
[edit ... protocols (mstp | rstp | vstp)]
user@host# set flag flag <flag-modifier> <disable>
```

You can specify the following spanning-tree protocol-specific **flag** options:

- **all**—Trace all operations.
- **all-failures**—Trace all failure conditions.
- **bpdu**—Trace BPDU reception and transmission.
- **bridge-detection-state-machine**—Trace the bridge detection state machine.
- **events**—Trace events of the protocol state machine.
- **port-information-state-machine**—Trace the port information state machine.
- **port-migration-state-machine**—Trace the port migration state machine.
- **port-receive-state-machine**—Trace the port receive state machine.
- **port-role-transit-state-machine**—Trace the port role transit state machine.
- **port-role-select-state-machine**—Trace the port role selection state machine.
- **port-transmit-state-machine**—Trace the port transmit state machine.
- **port-state-transit-state-machine**—Trace the port state transit state machine.
- **ppmd**—Trace the state and events for the ppm process.
- **state-machine-variables**—Trace when the state machine variables change.
- **timers**—Trace protocol timers.
- **topology-change-state-machine**—Trace the topology change state machine.



NOTE: Use the trace flag **all** with caution. This flag may cause the CPU to become very busy.

- b. To disable an individual spanning-tree protocol-specific option, include the
- disable**
- option with the
- flag**
- statement.

5. Verify the spanning-tree protocol-specific trace options.

```
[edit]
...
routing-options {
  traceoptions {
    ..global-trace-options-configuration...
  }
}
protocols {
  (mstp | rstp | vstp) {
```

```
traceoptions { # Spanning-tree protocol-specific.  
  file filename <files number> <size bytes> <world-readable | no-world-readable>;  
  flag flag <flag-modifier> <disable>;  
}  
}  
}  
...
```

- Related Documentation**
- [Spanning-Tree Protocols Supported on page 4](#)
 - [Example: Tracing Spanning-Tree Protocol Operations on page 40](#)

CHAPTER 6

Operational Commands

show bridge mac-table

Syntax	<code>show bridge mac-table</code> <code><brief count detail extensive></code> <code><bridge-domain (all <i>bridge-domain-name</i>)></code> <code><global-count></code> <code><interface <i>interface-name</i>></code> <code><mac-address></code> <code><vlan-id (all-vlan <i>vlan-id</i>)></code>
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 114 show bridge mac-table brief on page 114 show brief mac-table count on page 114 show bridge mac-table detail on page 114
Output Fields	Table 5 on page 113 describes the output fields for the show bridge mac-table command. Output fields are listed in the approximate order in which they appear.

Table 5: 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 mac-rewrite interface

Syntax	show mac-rewrite interface <brief detail> <interface-name>
Release Information	Command introduced in Junos OS Release 9.1.
Description	(MX Series routers only) Display Layer 2 protocol tunneling information.
Options	brief detail —(Optional) Display the specified level of output. interface <i>interface-name</i> —(Optional) Display Layer 2 protocol tunneling information for the specified interface.
Required Privilege Level	view
List of Sample Output	show mac-rewrite interface on page 116
Output Fields	Table 6 on page 116 lists the output fields for the show mac-rewrite interface command. Output fields are listed in the approximate order in which they appear.

Table 6: show mac-rewrite interface Output Fields

Field Name	Field Description	Level of Output
Interface	Name of the interface that has Layer 2 protocol tunneling configured on it.	brief detail
Protocols	Layer 2 protocols being tunneled on this interface: Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunk Protocol (VTP)	brief detail

Sample Output

```

show mac-rewrite interface  user@host> show mac-rewrite interface
                             Interface      Protocols
                             ge-1/0/1      STP VTP CDP

```

show spanning-tree bridge

Syntax	show spanning-tree bridge <brief detail> <msti <i>msti-id</i> > <routing-instance <i>routing-instance-name</i> > <vlan-id <i>vlan-id</i> >
Syntax (QFX Series)	show spanning-tree bridge <brief detail> <msti <i>msti-id</i> > <vlan-id <i>vlan-id</i> >
Release Information	Command introduced in Junos OS Release 8.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
Description	Display the configured or calculated Spanning Tree Protocol (STP) parameters.
Options	<p>none—(Optional) Display brief STP bridge information for all multiple spanning-tree instances (MSTIs).</p> <p>brief detail—(Optional) Display the specified level of output.</p> <p>msti <i>msti-id</i>—(Optional) Display STP bridge information for the specified MSTI.</p> <p>routing-instance <i>routing-instance-name</i>—(Optional) Display STP bridge information for the specified routing instance.</p> <p>vlan-id <i>vlan-id</i>—(Optional) Display STP bridge information for the specified VLAN.</p>
Required Privilege Level	view
List of Sample Output	show spanning-tree bridge routing-instance on page 119 show spanning-tree bridge msti on page 119 show spanning-tree bridge vlan-id (MSTP) on page 120 show spanning-tree bridge (RSTP) on page 120 show spanning-tree bridge vlan-id (RSTP) on page 121
Output Fields	Table 7 on page 117 lists the output fields for the show spanning-tree bridge command. Output fields are listed in the approximate order in which they appear.

Table 7: show spanning-tree bridge Output Fields

Field Name	Field Description
Routing instance name	Name of the routing instance under which the bridge is configured.
Enabled protocol	Spanning Tree Protocol type enabled.
Root ID	Bridge ID of the elected spanning-tree root bridge. The bridge ID consists of a configurable bridge priority and the MAC address of the bridge.

Table 7: show spanning-tree bridge Output Fields (*continued*)

Field Name	Field Description
Root cost	Calculated cost to reach the root bridge from the bridge where the command is entered.
Root port	Interface that is the current elected root port for this bridge.
CIST regional root	Bridge ID of the elected MSTP regional root bridge.
CIST internal root cost	Calculated cost to reach the regional root bridge from the bridge where the command is entered.
Hello time	Configured number of seconds between transmissions of configuration bridge protocol data units (BPDUs).
Maximum age	Configured maximum expected arrival time of hello bridge protocol data units (BPDUs).
Forward delay	How long an STP bridge port remains in the listening and learning states before transitioning to the forwarding state.
Hop count	Configured maximum number of hops a BPDU can be forwarded in the MSTP region.
Message age	Number of elapsed seconds since the most recent BPDU was received.
Number of topology changes	Total number of STP topology changes detected since the routing device last booted.
Time since last topology change	Number of elapsed seconds since the most recent topology change.
Bridge ID (Local)	Locally configured bridge ID. The bridge ID consists of a configurable bridge priority and the MAC address of the bridge.
Extended system ID	System identifier.
MSTI regional root	Bridge ID of the elected MSTP regional root bridge.

Sample Output

```

show spanning-tree bridge routing-instance user@host> show spanning-tree bridge routing-instance vs1 detail
bridge routing-instance STP bridge parameters
Routing instance name      : vs1
Enabled protocol          : MSTP

STP bridge parameters for CIST
Root ID                   : 32768.00:13:c3:9e:c8:80
Root cost                  : 0
Root port                 : ge-10/2/0
CIST regional root        : 32768.00:13:c3:9e:c8:80
CIST internal root cost   : 22000
Hello time                 : 2 seconds
Maximum age               : 20 seconds
Forward delay             : 15 seconds
Hop count                 : 18
Message age               : 0
Number of topology changes : 1
Time since last topology change : 1191 seconds
Local parameters
  Bridge ID               : 32768.00:90:69:0b:7f:d1
  Extended system ID      : 1

STP bridge parameters for MSTI 1
MSTI regional root        : 32769.00:13:c3:9e:c8:80
Root cost                 : 22000
Root port                 : ge-10/2/0
Hello time                : 2 seconds
Maximum age               : 20 seconds
Forward delay             : 15 seconds
Hop count                 : 18
Number of topology changes : 1
Time since last topology change : 1191 seconds
Local parameters
  Bridge ID               : 32769.00:90:69:0b:7f:d1
  Extended system ID      : 1

STP bridge parameters for MSTI 2
MSTI regional root        : 32770.00:13:c3:9e:c8:80
Root cost                 : 22000
Root port                 : ge-10/2/0
Hello time                : 2 seconds
Maximum age               : 20 seconds
Forward delay             : 15 seconds
Hop count                 : 18
Number of topology changes : 1
Time since last topology change : 1191 seconds
Local parameters
  Bridge ID               : 32770.00:90:69:0b:7f:d1
  Extended system ID      : 1

show spanning-tree bridge msti user@host> show spanning-tree bridge msti 1 routing-instance vs1 detail
bridge msti STP bridge parameters
Routing instance name      : vs1
Enabled protocol          : MSTP

STP bridge parameters for MSTI 1
MSTI regional root        : 32769.00:13:c3:9e:c8:80

```

```
Root cost                : 22000
Root port                : xe-10/2/0
Hello time               : 2 seconds
Maximum age              : 20 seconds
Forward delay            : 15 seconds
Hop count                : 18
Number of topology changes : 1
Time since last topology change : 1191 seconds
Local parameters
  Bridge ID              : 32769.00:90:69:0b:7f:d1
  Extended system ID     : 1
```

show spanning-tree bridge vlan-id (MSTP)

```
user@host> show spanning-tree bridge vlan-id 1101 routing-instance vs1 detail
```

```
STP bridge parameters
Routing instance name    : vs1
Enabled protocol        : MSTP

STP bridge parameters for CIST
Root ID                 : 32768.00:13:c3:9e:c8:80
Root cost               : 0
Root port               : xe-10/2/0
CIST regional root      : 32768.00:13:c3:9e:c8:80
CIST internal root cost : 22000
Hello time              : 2 seconds
Maximum age             : 20 seconds
Forward delay           : 15 seconds
Hop count               : 18
Message age             : 0
Number of topology changes : 0
Local parameters
  Bridge ID             : 32768.00:90:69:0b:7f:d1
  Extended system ID    : 1
  Hello time            : 2 seconds
  Maximum age           : 20 seconds
  Forward delay         : 15 seconds
  Path cost method      : 32 bit
  Maximum hop count     : 20
```

show spanning-tree bridge (RSTP)

```
user@host> show spanning-tree bridge
```

```
STP bridge parameters
Routing instance name    : GLOBAL
Enabled protocol        : RSTP
Root ID                 : 28672.00:90:69:0b:3f:d0
Hello time              : 2 seconds
Maximum age             : 20 seconds
Forward delay           : 15 seconds
Message age             : 0
Number of topology changes : 58
Time since last topology change : 14127 seconds
Local parameters
  Bridge ID             : 28672.00:90:69:0b:3f:d0
  Extended system ID    : 0

STP bridge parameters for bridge VLAN 10
Root ID                 : 28672.00:90:69:0b:3f:d0
Hello time              : 2 seconds
Maximum age             : 20 seconds
Forward delay           : 15 seconds
Message age             : 0
Number of topology changes : 58
```



```

Time since last topology change : 14127 seconds
Local parameters
  Bridge ID           : 28672.00:90:69:0b:3f:d0
  Extended system ID  : 0

STP bridge parameters for bridge VLAN 20
Root ID               : 28672.00:90:69:0b:3f:d0
Hello time            : 2 seconds
Maximum age           : 20 seconds
Forward delay         : 15 seconds
Message age           : 0
Number of topology changes : 58
Time since last topology change : 14127 seconds
Local parameters
  Bridge ID           : 28672.00:90:69:0b:3f:d0
  Extended system ID  : 0

```

**show spanning-tree
bridge vlan-id (RSTP)**

```

user@host> show spanning-tree bridge vlan-id 10
STP bridge parameters
Routing instance name      : GLOBAL
Enabled protocol           : RSTP

STP bridge parameters for VLAN 10
Root ID                   : 28672.00:90:69:0b:3f:d0
Hello time                : 2 seconds
Maximum age               : 20 seconds
Forward delay             : 15 seconds
Message age               : 0
Number of topology changes : 58
Time since last topology change : 14127 seconds
Local parameters
  Bridge ID               : 28672.00:90:69:0b:3f:d0
  Extended system ID      : 0

```

show spanning-tree interface

Syntax	show spanning-tree interface <brief detail> <msti <i>msti-id</i> > <routing-instance <i>routing-instance-name</i> > <vlan-id <i>vlan-id</i> >
Syntax (EX Series Switches and the QFX Series)	show spanning-tree interface <brief detail> <msti <i>msti-id</i> > <vlan-id <i>vlan-id</i> >
Release Information	Command introduced in Junos OS Release 8.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for the QFX Series.
Description	Display the configured or calculated interface-level STP parameters.
Options	<p>none—Display brief STP interface information.</p> <p>brief detail—(Optional) Display the specified level of output.</p> <p>msti <i>msti-id</i>—(Optional) Display STP interface information for the specified MST instance.</p> <p>routing-instance <i>routing-instance-name</i>—(Optional) Display STP interface information for the specified routing instance.</p> <p>vlan-id <i>vlan-id</i>—(Optional) Display STP interface information for the specified VLAN.</p>
Required Privilege Level	view
List of Sample Output	show spanning-tree interface on page 124 show spanning-tree interface (QFX Series) on page 124 show spanning-tree interface detail on page 125 show spanning-tree interface msti on page 126 show spanning-tree interface vlan-id on page 127 show spanning-tree interface (VSTP) on page 127 show spanning-tree interface vlan-id (VSTP) on page 127
Output Fields	Table 8 on page 122 lists the output fields for the show spanning-tree interface command. Output fields are listed in the approximate order in which they appear.

Table 8: show spanning-tree Interface Output Fields

Field Name	Field Description
Interface name	Interface configured to participate in the STP, RSTP, VSTP, or MSTP instance.

Table 8: show spanning-tree Interface Output Fields (*continued*)

Field Name	Field Description
Port ID	Logical interface identifier configured to participate in the MSTP or VSTP instance.
Designated port ID	Port ID of the designated port for the LAN segment to which this interface is attached.
Designated bridge ID	Bridge ID of the designated bridge for the LAN segment to which this interface is attached.
Port Cost	Configured cost for the interface.
Port State	STP port state: forwarding (FWD), blocking (BLK), listening, learning, or disabled.
Port Role	MSTP, VSTP, or RSTP port role: designated (DESG), backup (BKUP), alternate (ALT), (ROOT), or Root Prevented (Root-Prev).
Link type	MSTP, VSTP, or RSTP link type. Shared or point-to-point (pt-pt) and edge or nonedge.
Alternate	Identifies the interface as an MSTP, VSTP, or RSTP alternate root port (Yes) or nonalternate root port (No).
Boundary Port	Identifies the interface as an MSTP regional boundary port (Yes) or nonboundary port (No).

Sample Output

show spanning-tree
interface

user@host> show spanning-tree interface routing-instance vs1 detail
Spanning tree interface parameters for instance 0

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ae1	128:1	128:1	32768.0090690b47d1	1000	FWD	DESG
ge-2/1/2	128:2	128:2	32768.0090690b47d1	20000	FWD	DESG
ge-2/1/5	128:3	128:3	32768.0090690b47d1	29999	FWD	DESG
ge-2/2/1	128:4	128:26	32768.0013c39ec880	20000	FWD	ROOT
xe-9/2/0	128:5	128:5	32768.0090690b47d1	2000	FWD	DESG
xe-9/3/0	128:6	128:6	32768.0090690b47d1	2000	FWD	DESG

Spanning tree interface parameters for instance 1

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ae1	128:1	128:1	32769.0090690b47d1	1000	FWD	DESG
ge-2/1/2	128:2	128:2	32769.0090690b47d1	20000	FWD	DESG
ge-2/1/5	128:3	128:3	32769.0090690b47d1	29999	FWD	DESG
ge-2/2/1	128:4	128:26	32769.0013c39ec880	20000	FWD	ROOT
xe-9/2/0	128:5	128:5	32769.0090690b47d1	2000	FWD	DESG
xe-9/3/0	128:6	128:6	32769.0090690b47d1	2000	FWD	DESG

Spanning tree interface parameters for instance 2

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ae1	128:1	128:1	32770.0090690b47d1	1000	FWD	DESG
ge-2/1/2	128:2	128:2	32770.0090690b47d1	20000	FWD	DESG
ge-2/1/5	128:3	128:3	32770.0090690b47d1	29999	FWD	DESG
ge-2/2/1	128:4	128:26	32770.0013c39ec880	20000	FWD	ROOT
xe-9/2/0	128:5	128:5	32770.0090690b47d1	2000	FWD	DESG
xe-9/3/0	128:6	128:6	32770.0090690b47d1	2000	FWD	DESG

show spanning-tree
interface (QFX Series)

user@1f0> show spanning-tree interface routing-instance vs1 detail
Spanning tree interface parameters for instance 0

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ae1	128:1	128:1	32768.0090690b47d1	1000	FWD	DESG
ge-2/1/2	128:2	128:2	32768.0090690b47d1	20000	FWD	DESG
ge-2/1/5	128:3	128:3	32768.0090690b47d1	29999	FWD	DESG
ge-2/2/1	128:4	128:26	32768.0013c39ec880	20000	FWD	ROOT
xe-9/2/0	128:5	128:5	32768.0090690b47d1	2000	FWD	DESG
xe-9/3/0	128:6	128:6	32768.0090690b47d1	2000	FWD	DESG

Spanning tree interface parameters for instance 1

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ae1	128:1	128:1	32769.0090690b47d1	1000	FWD	DESG
ge-2/1/2	128:2	128:2	32769.0090690b47d1	20000	FWD	DESG
ge-2/1/5	128:3	128:3	32769.0090690b47d1	29999	FWD	DESG
ge-2/2/1	128:4	128:26	32769.0013c39ec880	20000	FWD	ROOT
xe-9/2/0	128:5	128:5	32769.0090690b47d1	2000	FWD	DESG
xe-9/3/0	128:6	128:6	32769.0090690b47d1	2000	FWD	DESG

Spanning tree interface parameters for instance 2

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ae1	128:1	128:1	32770.0090690b47d1	1000	FWD	DESG
ge-2/1/2	128:2	128:2	32770.0090690b47d1	20000	FWD	DESG
ge-2/1/5	128:3	128:3	32770.0090690b47d1	29999	FWD	DESG
ge-2/2/1	128:4	128:26	32770.0013c39ec880	20000	FWD	ROOT
xe-9/2/0	128:5	128:5	32770.0090690b47d1	2000	FWD	DESG
xe-9/3/0	128:6	128:6	32770.0090690b47d1	2000	FWD	DESG

**show spanning-tree
interface detail**user@host> **show spanning-tree interface routing-instance vs1 detail**

Spanning tree interface parameters for instance 0

```

Interface name           : ae1
Port identifier          : 128.1
Designated port ID      : 128.1
Port cost                : 1000
Port state               : Forwarding
Designated bridge ID     : 32768.00:90:69:0b:47:d1
Port role                : Designated
Link type                : Pt-Pt/NONEDGE
Boundary port           : No

```

```

Interface name           : ge-2/1/2
Port identifier          : 128.2
Designated port ID      : 128.2
Port cost                : 20000
Port state               : Forwarding
Designated bridge ID     : 32768.00:90:69:0b:47:d1
Port role                : Designated
Link type                : Pt-Pt/NONEDGE
Boundary port           : No

```

```

Interface name           : ge-2/1/5
Port identifier          : 128.3
Designated port ID      : 128.3
Port cost                : 29999
Port state               : Forwarding
Designated bridge ID     : 32768.00:90:69:0b:47:d1
Port role                : Designated
Link type                : Pt-Pt/NONEDGE
Boundary port           : No

```

```

Interface name           : ge-2/2/1
Port identifier          : 128.4
Designated port ID      : 128.26
Port cost                : 20000
Port state               : Forwarding
Designated bridge ID     : 32768.00:13:c3:9e:c8:80
Port role                : Root
Link type                : Pt-Pt/NONEDGE
Boundary port           : No

```

```

Interface name           : xe-9/2/0
Port identifier          : 128.5
Designated port ID      : 128.5
Port cost                : 2000
Port state               : Forwarding
Designated bridge ID     : 32768.00:90:69:0b:47:d1
Port role                : Designated

```

```
Link type           : Pt-Pt/NONEDGE
Boundary port       : No

Interface name       : xe-9/3/0
Port identifier      : 128.6
Designated port ID   : 128.6
Port cost            : 2000
Port state           : Forwarding
Designated bridge ID : 32768.00:90:69:0b:47:d1
Port role            : Designated
Link type           : Pt-Pt/NONEDGE
Boundary port       : No
```

Spanning tree interface parameters for instance 1

```
Interface name       : ae1
Port identifier      : 128.1
Designated port ID   : 128.1
Port cost            : 1000
Port state           : Forwarding
Designated bridge ID : 32768.00:90:69:0b:47:d1
Port role            : Designated
Link type           : Pt-Pt/NONEDGE
Boundary port       : No
```

```
Interface name       : ge-2/1/2
Port identifier      : 128.2
Designated port ID   : 128.2
Port cost            : 20000
Port state           : Forwarding
Designated bridge ID : 32768.00:90:69:0b:47:d1
Port role            : Designated
Link type           : Pt-Pt/NONEDGE
Boundary port       : No
```

```
Interface name       : ge-2/1/5
Port identifier      : 128.3
Designated port ID   : 128.3
Port cost            : 29999
Port state           : Forwarding
Designated bridge ID : 32768.00:90:69:0b:47:d1
Port role            : Designated
Link type           : Pt-Pt/NONEDGE
Boundary port       : No
```

```
Interface name       : ge-2/2/1
Port identifier      : 128.4
Designated port ID   : 128.26
Port cost            : 20000
Port state           : Forwarding
Designated bridge ID : 32768.00:13:c3:9e:c8:80
Port role            : Root
Link type           : Pt-Pt/NONEDGE
Boundary port       : No
```

...

show spanning-tree
interface msti

```
user@host> show spanning-tree interface msti 1 routing-instance vs1 detail
Spanning tree interface parameters for instance 1
```

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
xe-7/0/0	128:1	128:1	32769.0090690b4fd1	2000	FWD	DESG
ge-5/1/0	128:2	128:2	32769.0090690b4fd1	20000	FWD	DESG
ge-5/1/1	128:3	128:3	32769.0090690b4fd1	20000	FWD	DESG
ae1	128:4	128:1	32769.0090690b47d1	10000	BLK	ALT
ge-5/1/4	128:5	128:3	32769.0090690b47d1	20000	BLK	ALT
xe-7/2/0	128:6	128:6	32769.0090690b47d1	2000	FWD	ROOT

show spanning-tree interface vlan-id

```
user@host> show spanning-tree interface vlan-id 101 routing-instance vs1 detail
Spanning tree interface parameters for instance 0
```

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ge-11/0/5	128:1	128:1	32768.0090690b7fd1	20000	FWD	DESG
ge-11/0/6	128:2	128:1	32768.0090690b7fd1	20000	BLK	BKUP
ge-11/1/0	128:3	128:2	32768.0090690b4fd1	20000	BLK	ALT
ge-11/1/1	128:4	128:3	32768.0090690b4fd1	20000	BLK	ALT
ge-11/1/4	128:5	128:1	32768.0090690b47d1	20000	BLK	ALT
xe-10/0/0	128:6	128:5	32768.0090690b4fd1	2000	BLK	ALT
xe-10/2/0	128:7	128:4	32768.0090690b47d1	2000	FWD	ROOT

show spanning-tree interface (VSTP)

```
user@host> show spanning-tree interface
Spanning tree interface parameters for instance 0
```

Interface	Port ID	Designated port ID	Designated bridge ID	Cost	State	Role
ge-1/0/1	128:1	128:1	28672.0090690b3fe0	20000	FWD	DESG
ge-1/0/2	128:2	128:2	28672.0090690b3fe0	20000	FWD	DESG

Spanning tree interface parameters for VLAN 10

Interface	Port ID	Designated port ID	Designated bridge ID	Cost	State	Role
ge-1/0/1	128:1	128:1	28672.0090690b3fe0	20000	FWD	DESG
ge-1/0/2	128:2	128:2	28672.0090690b3fe0	20000	FWD	DESG

Spanning tree interface parameters for VLAN 20

Interface	Port ID	Designated port ID	Designated bridge ID	Cost	State	Role
ge-1/0/1	128:1	128:1	28672.0090690b3fe0	20000	FWD	DESG
ge-1/0/2	128:2	128:2	28672.0090690b3fe0	20000	FWD	DESG

show spanning-tree interface vlan-id (VSTP)

```
user@host> show spanning-tree interface vlan-id 10
Spanning tree interface parameters for VLAN 10
```

Interface	Port ID	Designated port ID	Designated bridge ID	Cost	State	Role
ge-1/0/1	128:1	128:1	28672.0090690b3fe0	20000	FWD	DESG
ge-1/0/2	128:2	128:2	28672.0090690b3fe0	20000	FWD	DESG

show spanning-tree mstp configuration

Syntax	show spanning-tree mstp configuration <brief detail> <routing-instance <i>routing-instance-name</i> >
Syntax (EX Series Switch and the QFX Series)	show spanning-tree mstp configuration <brief detail>
Release Information	Command introduced in Junos OS Release 8.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for the QFX Series.
Description	Display the MSTP configuration.
Options	none —Display MSTP configuration information. brief detail —(Optional) Display the specified level of output. routing-instance <i>routing-instance-name</i> —(Optional) Display MSTP configuration information for the specified routing instance.
Required Privilege Level	view
List of Sample Output	show spanning-tree mstp configuration detail on page 129 show spanning-tree mstp configuration detail (QFX Series) on page 129
Output Fields	Table 9 on page 128 lists the output fields for the show spanning-tree mstp configuration command. Output fields are listed in the approximate order in which they appear.

Table 9: show spanning-tree mstp configuration Output Fields

Field Name	Field Description
Context id	Internally generated identifier.
Region name	MSTP region name carried in the MSTP BPDUs.
Revision	Revision number of the MSTP configuration.
Configuration digest	Numerical value derived from the VLAN-to-instance mapping table.
MSTI	MST instance identifier.
Member VLANs	VLAN identifiers associated with the MSTI.

Sample Output

**show spanning-tree
mstp configuration
detail**

```
user@host> show spanning-tree mstp configuration routing-instance vs1 detail
MSTP configuration information
Context identifier      : 1
Region name            : henry
Revision               : 3
Configuration digest    : 0x6da4b5c4fd587757eef35675365e1
```

```
MSTI      Member VLANs
 0 0-99,101-199,201-4094
 1 100
 2 200
```

**show spanning-tree
mstp configuration
detail (QFX Series)**

```
user@1f0> show spanning-tree mstp configuration routing-instance vs1 detail
MSTP configuration information
Context identifier      : 1
Region name            : henry
Revision               : 3
Configuration digest    : 0x6da4b5c4fd587757eef35675365e1
```

```
MSTI      Member VLANs
 0 0-99,101-199,201-4094
 1 100
 2 200
```

show spanning-tree statistics

Syntax	show spanning-tree statistics <brief detail> <interface <i>interface-name</i> > <routing-instance <i>routing-instance-name</i> >
Syntax (EX Series Switch and the QFX Series)	show spanning-tree statistics <brief detail> <interface <i>interface-name</i> vlan <i>vlan-id</i> >
Release Information	Command introduced in Junos OS Release 8.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for QFX Series switches.
Description	Display STP statistics.
Options	<p>none—Display brief STP statistics.</p> <p>brief detail—(Optional) Display the specified level of output.</p> <p>interface <i>interface-name</i>—(Optional) Display STP statistics for the specified interface.</p> <p>routing-instance <i>routing-instance-name</i>—(Optional) Display STP statistics for the specified routing instance.</p>
Required Privilege Level	view
List of Sample Output	<p>show spanning-tree statistics routing-instance on page 131</p> <p>show spanning-tree statistics interface routing-instance detail on page 131</p>
Output Fields	Table 10 on page 130 lists the output fields for the show spanning-tree statistics command. Output fields are listed in the approximate order in which they appear.

Table 10: show spanning-tree statistics Output Fields

Field Name	Field Description
Message type	Type of message being counted.
BPDUs sent	Total number of BPDUs sent.
BPDUs received	Total number of BPDUs received.
BPDUs sent in last 5 secs	Number of BPDUs sent in the most recent 5-second period.
BPDUs received in last 5 secs	Number of BPDUs received in the most recent 5-second period.
Interface	Interface for which the statistics are being displayed.

Table 10: show spanning-tree statistics Output Fields (*continued*)

Field Name	Field Description
Next BPDU transmission	Number of seconds until the next BPDU is scheduled to be sent.

Sample Output

**show spanning-tree
statistics
routing-instance**

```
user@host> show spanning-tree statistics routing-instance vs1 detail
Routing instance level STP statistics
Message type           : bpdus
BPDUs sent              : 121
BPDUs received          : 537
BPDUs sent in last 5 secs : 5
BPDUs received in last 5 secs : 27
```

**show spanning-tree
statistics interface
routing-instance detail**

```
user@host> show spanning-tree statistics interface ge-11/1/4 routing-instance vs1 detail
Interface  BPDUs sent  BPDUs received  Next BPDU
              transmission
ge-11/1/4      7           190             0
```

