

Layer 2 Services — Spanning-Tree Protocols

Release
13.1



Published: 2014-06-04

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Layer 2 Services — Spanning-Tree Protocols

13.1

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- Documentation Feedback on page xv
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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:

- MX 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.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

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

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

Convention	Description	Examples
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none">Introduces or emphasizes important new terms.Identifies guide 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 CLI User 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 domain-name
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)	Encloses optional keywords or variables.	stub <default-metric <i>metric</i> >;
(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</i> <i>string2</i> <i>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)	Encloses a variable for which you can substitute one or more values.	community name members [community-ids]
Indentation and braces ({ })	Identifies 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.	
GUI Conventions		
Bold text like this	Represents 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.

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

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu 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)

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- 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>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

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- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- 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:
<http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- 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 Protocols on page 3](#)

CHAPTER 1

Spanning-Tree Protocols

- [Spanning-Tree Protocols Supported on MX Series Routers on page 3](#)
- [BPDU Overview on page 4](#)

Spanning-Tree Protocols Supported on MX Series Routers

On MX Series routers 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 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](#)
- [Root Protection for Spanning-Tree Instance Interfaces Overview](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview](#)

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, 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 ppm 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 ppm process on the Packet Forwarding Engine. For more information, see the *Junos OS High Availability Configuration Guide*.

On MX Series routers 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 MX Series Routers on page 3](#)
- [Loop Protection for Spanning-Tree Instance Interfaces Overview](#)
- [Root Protection for Spanning-Tree Instance Interfaces Overview](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview](#)

PART 2

Configuration

- [Configuration Guidelines for Spanning-Tree Protocols on page 9](#)
- [Configuration Tasks for Spanning-Tree Protocols on page 17](#)
- [Spanning-Tree Protocol Examples on page 33](#)
- [Configuration Statements for Spanning-Tree Protocols on page 51](#)

CHAPTER 2

Configuration Guidelines for Spanning-Tree Protocols

- [Spanning-Tree Protocols in Logical Systems on page 9](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 10](#)
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- [Provider Bridge Participation in RSTP or MSTP Instances on page 11](#)
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- [Maximum Age for Awaiting Arrival of Hello BPDUs on page 12](#)
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- [Spanning-Tree Instance Interface Configured as an Edge Port on page 15](#)
- [Spanning-Tree Protocol Trace Options on page 16](#)

Spanning-Tree Protocols in Logical Systems

On MX Series routers 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 MX Series Routers on page 3](#)

RSTP or VSTP Forced to Run as IEEE 802.1D STP

On MX Series routers 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 MX Series Routers on page 3](#)
 - [Configuring Rapid Spanning-Tree Protocol on page 17](#)
 - [Configuring VLAN Spanning-Tree Protocol on page 25](#)
 - [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 10](#)
 - [force-version on page 62](#)

Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP

On MX Series routers 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 MX Series Routers on page 3](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 10](#)
- [Configuring Rapid Spanning-Tree Protocol on page 17](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)

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 MX Series Routers on page 3](#)
- [Configuring Rapid Spanning-Tree Protocol on page 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [bpd-destination-mac-address on page 56](#)

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 17](#)

- [extended-system-id on page 62](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [bridge-priority on page 57](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [max-age on page 66](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)

- [hello-time on page 64](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [forward-delay on page 63](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [cost on page 59](#)
- [edge on page 61](#)
- [interface \(Spanning Tree\) on page 65](#)
- [mode on page 68](#)
- [priority on page 71](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [interface \(Spanning Tree\) on page 65](#)
- [priority on page 71](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [cost on page 59](#)
- [interface \(Spanning Tree\) on page 65](#)

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 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [mode on page 68](#)
- [interface \(Spanning Tree\) on page 65](#)

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

- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on page 45](#)
- [Configuring Rapid Spanning-Tree Protocol on page 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)

- [edge](#) on page 61
- [interface \(Spanning Tree\)](#) on page 65

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 17
- [Configuring Multiple Spanning-Tree Protocol](#) on page 20
- [Configuring VLAN Spanning-Tree Protocol](#) on page 25
- [Example: Tracing Spanning-Tree Protocol Operations](#) on page 33
- [traceoptions \(Spanning Tree\)](#) on page 74

CHAPTER 3

Configuration Tasks for Spanning-Tree Protocols

- [Configuring Rapid Spanning-Tree Protocol on page 17](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring MST Instances on a Physical Interface on page 23](#)
- [Disabling MSTP on page 24](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)
- [Tracing Spanning-Tree Operations on page 29](#)

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 89](#).

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 12](#).

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.
      bpdu-destination-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 MX Series Routers on page 3](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 10](#)
- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 10](#)
- [Provider Bridge Participation in RSTP or MSTP Instances on page 11](#)
- [System Identifier for Bridges in STP or RSTP Instances on page 11](#)

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 MSTP under protocols hierarchy:

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

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

```
[edit ... protocols mstp]
user@host# set bpd-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 89](#).

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 12](#).

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
```

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 MX Series Routers on page 3](#)
- [Configuring MST Instances on a Physical Interface on page 23](#)
- [Disabling MSTP on page 24](#)

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 20.

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 12.

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 MX Series Routers on page 3](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Disabling MSTP on page 24](#)

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 MX Series Routers on page 3](#)
- [Configuring Multiple Spanning-Tree Protocol on page 20](#)
- [Configuring MST Instances on a Physical Interface on page 23](#)

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 89](#).

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 12](#).

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 89](#).

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 MX Series Routers on page 3](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 10](#)
- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 10](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Overview](#)
- [VPLS Multihomed Layer 2 Ring and MPLS Infrastructure Topology](#)

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 MX Series Routers on page 3](#)
 - [Example: Tracing Spanning-Tree Protocol Operations on page 33](#)

CHAPTER 4

Spanning-Tree Protocol Examples

- [Example: Blocking BPDUs on Aggregated Ethernet for 600 Seconds on page 33](#)
- [Example: Tracing Spanning-Tree Protocol Operations on page 33](#)
- [Example: Configuring VSTP on a Trunk Port with Tagged Traffic on page 34](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on page 45](#)

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](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces](#)
- [BPDU Protection on All Edge Ports of the Bridge](#)
- [Checking the Status of Spanning-Tree Instance Interfaces on page 89](#)
- [Clearing the Blocked Status of a Spanning-Tree Instance Interface on page 90](#)

Example: Tracing Spanning-Tree Protocol Operations

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

```
[edit]
routing-options {
  traceoptions {
    file routing-log size 10m world-readable;
    flag all;
  }
}
```

```
}
protocols {
  rstp {
    traceoptions {
      file rstp-log size 10m world-readable;
      flag all;
    }
  }
}
```

**Related
Documentation**

- [Spanning-Tree Protocols Supported on MX Series Routers on page 3](#)
- [Tracing Spanning-Tree Operations on page 29](#)

Example: Configuring VSTP on a Trunk Port with Tagged Traffic

- [VSTP on a Trunk Port with Tagged Traffic Overview on page 34](#)
- [Example: Configuring VSTP on a Trunk Port with Tagged Traffic on page 34](#)

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 34](#)
- [Overview on page 35](#)
- [Configuration on page 35](#)
- [Verification on page 43](#)

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

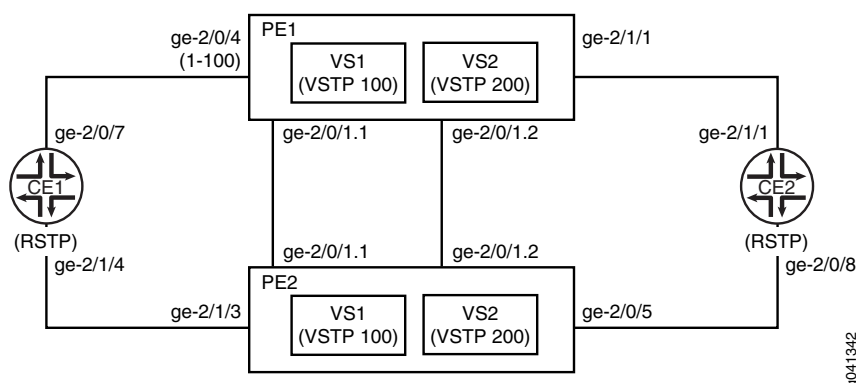
This example shows how to configure VSTP on a trunk port with tagged traffic.

Topology

Figure 1 on page 35 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 1: 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 43](#)
- [Verifying the STP Bridge Parameters of the Routing Instances on page 44](#)
- [Displaying STP Statistics for the Configured Bridge on page 44](#)

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: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations

MX Series routers provide Layer 2 loop prevention through the Spanning Tree Protocol (STP), Rapid Spanning Tree protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP). All spanning-tree protocols use a special type of frame called a bridge protocol data unit (BPDU) to communicate. Other devices—PC bridging applications, for example also use BPDUs and generate their own BPDUs. These different BPDUs are not compatible. When BPDUs generated by spanning-tree protocols are transmitted to a device that uses another type of BPDU, they can cause problems on the device. Similarly, if routers within a spanning-tree topology receive BPDUs from other devices, network outages can occur because of STP miscalculations.

This example configures BPDU protection on MX Series routers that use RSTP. The upstream configuration is done on the edge interfaces, where outside BPDUs are often received from other devices.

- [Requirements on page 46](#)
- [Overview on page 46](#)
- [Configuration on page 47](#)
- [Verification on page 48](#)

Requirements

This example uses the following hardware and software components:

- Two MX Series routers in an RSTP topology
- Junos OS Release 13.1 or later

Before you configure the interfaces on Router 2 for BPDU protection, be sure you have:

- RSTP enabled on the routers.

Overview

The MX Series routers, being in an RSTP topology, support a loop-free network through the exchange of BPDUs. Receipt of outside BPDUs in an STP, RSTP, or MSTP topology, however, can lead to network outages by triggering an STP misconfiguration. To prevent such outages, enable BPDU protection on STP interfaces that could receive outside BPDUs. If an outside BPDU is received on a BPDU-protected interface, the interface shuts down to prevent the outside BPDU from accessing the STP interface.

[Figure 2 on page 47](#) shows the topology for this example. In this example, Router 1 and Router 2 are configured for RSTP and create a loop-free topology. The interfaces on Router 2 are edge access ports which frequently receive outside BPDUs generated by PC applications.

This example configures interface ge-0/0/5.0 and interface ge-0/0/6.0 as edge ports on Router 2, and then configures BPDU protection on those ports. With BPDU protection enabled, these interfaces shut down when they encounter an outside BPDU sent by the PCs connected to Router 2.

Topology

Figure 2: BPDU Protection Topology

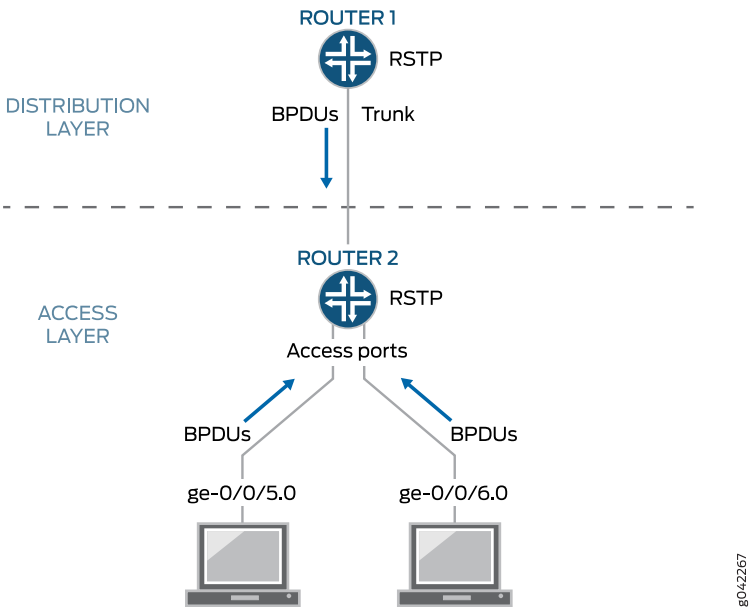


Table 3 on page 47 describes the components that are configured for BPDU protection.

Table 3: Components of the Topology for Configuring BPDU Protection on MX Series Routers

Property	Settings
Router 1 (Distribution Layer)	Router 1 is connected to Router 2 on a trunk interface.
Router 2 (Access Layer)	Router 2 has these access ports that require BPDU protection: <ul style="list-style-type: none">ge-0/0/5.0ge-0/0/6.0

This configuration example uses RSTP topology. You also can configure BPDU protection for STP or MSTP topologies at the `[edit protocols (mstp|rstp|vstp)]` hierarchy level.

Configuration

CLI Quick Configuration	To quickly configure RSTP on the two Router 2 interfaces and configure BPDU protection on all edge ports on Router 2, 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 <code>[edit]</code> hierarchy level:
Router 2	<pre>set protocols rstp interface ge-0/0/5.0 edge set protocols rstp interface ge-0/0/6.0 edge set protocols rstp bpdu-block-on-edge</pre>

Configuring Router 2

Step-by-Step Procedure To configure RSTP on the two Router 2 interfaces, and then configure BPDU protection:

1. Configure RSTP on interface ge-0/0/5.0 and interface ge-0/0/6.0, and configure them as edge ports.

```
[edit protocols rstp]
user@Router2# set interface ge-0/0/5.0 edge
user@Router2# set interface ge-0/0/6.0 edge
```

2. Configure BPDU protection on all edge ports on this router.

```
[edit protocols rstp]
user@Router2# set bpdu-block-on-edge
```

Results

From configuration mode, confirm your configuration by entering the **show configuration protocols rstp** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@Router2> show configuration protocols rstp
interface ge-0/0/5.0 {
  edge;
}
interface ge-0/0/6.0 {
  edge;
}
bpdu-block-on-edge;
```

Verification

Verify that the configuration is working properly.

- [Displaying the Interface State Before BPDU Protection Is Triggered on page 48](#)
- [Verifying That BPDU Protection Is Working Correctly on page 49](#)

Displaying the Interface State Before BPDU Protection Is Triggered

Purpose Before BPDUs can be received from PCs connected to interface ge-0/0/5.0 and interface ge-0/0/6.0, confirm the interface state.

Action Use the operational mode command **show spanning-tree instance**

```
user@Router2> show spanning-tree interface
```

Spanning tree interface parameters for instance 0

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ge-0/0/0.0	128:513	128:513	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/1.0	128:514	128:514	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/2.0	128:515	128:515	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/3.0	128:516	128:516	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/4.0	128:517	128:517	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/5.0	128:518	128:518	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/6.0	128:519	128:519	32768.0019e2503f00	20000	FWD	DESG

[output truncated]

Meaning The output from the **show spanning-tree interface** command shows that interface ge-0/0/5.0 and interface ge-0/0/6.0 are ports in a forwarding state.

Verifying That BPDU Protection Is Working Correctly

Purpose In this example, the PCs connected to Router 2 start sending BPDUs to interface ge-0/0/5.0 and interface ge-0/0/6.0. Verify that BPDU protection is working on the interfaces.

Action Use the operational mode command **show spanning-tree interface**.

```
user@Router2> show spanning-tree interface
```

Spanning tree interface parameters for instance 0

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ge-0/0/0.0	128:513	128:513	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/1.0	128:514	128:514	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/2.0	128:515	128:515	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/3.0	128:516	128:516	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/4.0	128:517	128:517	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/5.0	128:518	128:518	32768.0019e2503f00	20000	BLK	DIS
(Bpdu-Incon)						
ge-0/0/6.0	128:519	128:519	32768.0019e2503f00	20000	BLK	DIS
(Bpdu-Incon)						
ge-0/0/7.0	128:520	128:1	16384.00aabbcc0348	20000	FWD	ROOT
ge-0/0/8.0	128:521	128:521	32768.0019e2503f00	20000	FWD	DESG

[output truncated]

Meaning When BPDUs are sent from the PCs to interface ge-0/0/5.0 and interface ge-0/0/6.0 on Router 2, the output from the operational mode command **show spanning-tree interface** shows that the interfaces have transitioned to a BPDU inconsistent state. The BPDU inconsistent state causes the interfaces to shut down.

Disabling the BPDU protection configuration on an interface does not automatically re-enable the interface. However, if the **disable-timeout** statement has been included in the BPDU configuration, the interface does return to service after the timer expires.

Otherwise, you must use the operational mode command **clear error bpdv interface *interface-name*** to unblock and re-enable the interface.

If the PCs connected to Router 2 send BPDUs to the interfaces again, BPDU protection is triggered once more, and the interfaces transition back to the BPDU inconsistent state, causing them to shut down. In such cases, you need to find and repair the misconfiguration on the PCs that are sending BPDUs to Router 2.

**Related
Documentation**

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

CHAPTER 5

Configuration Statements for Spanning-Tree Protocols

- [\[edit protocols mstp\] Hierarchy Level on page 52](#)
- [\[edit protocols rstp\] Hierarchy Level on page 53](#)
- [\[edit protocols vstp\] Hierarchy Level on page 54](#)
- [protocols \(STP Type\) on page 55](#)
- [access-trunk on page 56](#)
- [bpdu-destination-mac-address \(Spanning Tree\) on page 56](#)
- [bridge-priority on page 57](#)
- [configuration-name on page 58](#)
- [cost on page 59](#)
- [disable on page 60](#)
- [edge on page 61](#)
- [extended-system-id on page 62](#)
- [force-version \(IEEE 802.1D STP\) on page 62](#)
- [forward-delay on page 63](#)
- [hello-time on page 64](#)
- [interface \(Spanning Tree\) on page 65](#)
- [max-age on page 66](#)
- [max-hops on page 67](#)
- [mode \(Protocols STP\) on page 68](#)
- [msti on page 69](#)
- [mstp on page 70](#)
- [priority \(Protocols STP\) on page 71](#)
- [revision-level on page 72](#)
- [rstp on page 73](#)
- [traceoptions \(Spanning Tree\) on page 74](#)
- [vlan \(MSTP\) on page 77](#)

- [vlan \(VSTP\) on page 78](#)
- [vstp on page 79](#)
- [\[edit protocols layer2-control\] Hierarchy Level on page 80](#)
- [interface \(Layer 2 Protocol Tunneling\) on page 81](#)
- [layer2-control on page 82](#)
- [mac-rewrite on page 83](#)
- [protocol on page 83](#)

[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 17 • Configuring Multiple Spanning-Tree Protocol on page 20 • Configuring VLAN Spanning-Tree Protocol on page 25

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 34

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 4• Provider Bridge Participation in RSTP or MSTP Instances on page 11• Configuring Rapid Spanning-Tree Protocol on page 17• Configuring Multiple Spanning-Tree Protocol on page 20

bridge-priority

Syntax	<code>bridge-priority <i>priority</i>;</code>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols (mstp rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp msti msti-id],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp vlan vlan-id],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti msti-id],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp vlan vlan-id],</p> <p>[edit protocols (mstp rstp)],</p> <p>[edit protocols mstp msti msti-id],</p> <p>[edit protocols vstp vlan vlan-id],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp rstp)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti msti-id],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp vlan vlan-id]</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	Determine which bridge is elected as the root bridge. If two bridges have the same path cost to the root bridge, the bridge priority determines which bridge becomes the designated bridge for a LAN segment.
Options	<p>priority—The bridge priority can be set only in increments of 4096.</p> <p>Range: 0 through 61,440</p> <p>Default: 32,768</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"> • Bridge Priority for Election of Root Bridge and Designated Bridge on page 12

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 4• Configuring Multiple Spanning-Tree Protocol on page 20

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 msti msti-id interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp vlan vlan-id 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 msti-id 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 vlan-id interface <i>interface-name</i>],</p> <p>[edit protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti msti-id interface <i>interface-name</i>],</p> <p>[edit protocols vstp vlan vlan-id 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 msti-id interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp vlan vlan-id 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 13 • Spanning-Tree Instance Interface Cost on page 14

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 20• Disabling MSTP on page 24

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 msti-id interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp vlan vlan-id 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 msti-id 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 vlan-id interface <i>interface-name</i>],</p> <p>[edit protocols (mstp rstp vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti msti-id interface <i>interface-name</i>],</p> <p>[edit protocols vstp vlan vlan-id 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 msti-id interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp vlan vlan-id 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 13 • Spanning-Tree Instance Interface Configured as an Edge Port on page 15

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 11• Configuring Rapid Spanning-Tree Protocol on page 17

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 MX Series Routers on page 3• RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 10• Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 10

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 13

hello-time

Syntax	<code>hello-time 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 number of seconds between transmissions of configuration BPDUs by the root bridge.
Options	seconds —(Optional) Number of seconds between transmissions of configuration BPDUs. Range: 1 through 10 Default: 2 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">• Hello Time for Root Bridge to Transmit Hello BPDUs on page 12

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 vlan <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 vlan <i>vlan-id</i>],</p> <p>[edit protocols (mstp rstp vstp)],</p> <p>[edit protocols vstp vlan <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 vlan <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 13

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 12

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 20

mode (Protocols STP)

Syntax	<code>mode (p2p shared);</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 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 8.4.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>
Description	Configure link mode to identify point-to-point links.



NOTE: 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	<p>p2p—The link is point to point.</p> <p>shared—The link is shared media.</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 13 • Spanning-Tree Instance Interface Point-to-Point Link Mode on page 15

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 20 • Configuring MST Instances on a Physical Interface on page 23

mstp

Syntax	<pre> mstp { bpd-block-on-edge; bridge-priority priority; configuration-name configuration-name; disable; forward-delay seconds; hello-time seconds; max-age seconds; max-hops hops; priority-hold-time seconds; revision-level revision-level; interface interface-name { bpd-timeout-action { alarm; block; } cost cost; edge; mode (p2p shared); no-root-port; priority interface-priority; } msti msti-id { bridge-priority priority; interface interface-name { cost cost; edge; priority interface-priority; } vlan vlan-id; } 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 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 20](#)

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 13](#)
- [Spanning-Tree Instance Interface Configured as an Edge Port on page 15](#)
- [Spanning-Tree Instance Interface Priority on page 13](#)

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 20

rstp

Syntax	<pre> rstp { bpdv-block-on-edge; bpdv-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 { bpdv-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>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 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 17

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.• bpdud—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 16• Tracing Spanning-Tree Operations on page 29• Example: Tracing Spanning-Tree Protocol Operations on page 33
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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 msti msti-id], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti msti-id], [edit protocols mstp msti msti-id], [edit routing-instances <i>routing-instance-name</i> protocols mstp msti msti-id]
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	<p><i>vlan-id</i>—The VLAN identifier associated with the MSTI.</p> <p><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.</p> <p>Range: 1 through 4096</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"> • Configuring Multiple Spanning-Tree Protocol on page 20

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 25

vstp

Syntax	<pre> 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>; } } </pre>
Hierarchy Level	<p>[edit logical-systems <i>logical-system-name</i> protocols], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols], [edit protocols], [edit routing-instances <i>routing-instance-name</i> protocols]</p>
Release Information	<p>Statement introduced in Junos OS Release 9.0.</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 logical systems added in Junos OS Release 9.6.</p>
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

- [Configuring VLAN Spanning-Tree Protocol on page 25](#)

[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*

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">• <i>Layer 2 Protocol Tunneling Through a Network Overview</i>

layer2-control

Syntax

```
layer2-control {  
  bpdv-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.
bpdv-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*
- *Layer 2 Protocol Tunnel Interface*
- *Layer 2 Protocol to be Tunneled*
- *Configuring Layer 2 Protocol Tunneling*
- *instance-type*

mac-rewrite

Syntax	<pre>mac-rewrite { interface interface-name { 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"> • <i>Layer 2 Protocol Tunneling Through a Network Overview</i>

protocol

Syntax	protocol (cdp stp vtp);
Hierarchy Level	[edit protocols layer2-control mac-rewrite interface interface-name],
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"> • <i>Layer 2 Protocol Tunneling Through a Network Overview</i> • <i>Layer 2 Protocol Tunnel Interface</i> • <i>Layer 2 Protocol to be Tunneled</i> • <i>Configuring Layer 2 Protocol Tunneling</i>

PART 3

Administration

- [Managing Spanning-Tree Protocol Mode on page 87](#)
- [Managing Spanning-Tree Instance Interface Status on page 89](#)
- [Operational Mode Commands for Basic Spanning-Tree Configuration on page 93](#)
- [Operational Mode Commands for Spanning-Tree Statistics on page 109](#)

Managing Spanning-Tree Protocol Mode

- [Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP on page 87](#)

Reverting RSTP or VSTP Back From Forced IEEE 802.1D STP

On MX Series routers 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 MX Series Routers on page 3](#)
- [RSTP or VSTP Forced to Run as IEEE 802.1D STP on page 10](#)
- [Configuring Rapid Spanning-Tree Protocol on page 17](#)
- [Configuring VLAN Spanning-Tree Protocol on page 25](#)

CHAPTER 7

Managing Spanning-Tree Instance Interface Status

- [Checking the Status of Spanning-Tree Instance Interfaces on page 89](#)
- [Clearing the Blocked Status of a Spanning-Tree Instance Interface on page 90](#)
- [Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 90](#)
- [Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 91](#)

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](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces](#)
- [BPDU Protection on All Edge Ports of the Bridge](#)
- [Clearing the Blocked Status of a Spanning-Tree Instance Interface on page 90](#)

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*.

Related Documentation

- [Root Protection for Spanning-Tree Instance Interfaces Overview](#)
- [BPDU Protection for Spanning-Tree Instance Interfaces Overview](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces](#)
- [BPDU Protection on All Edge Ports of the Bridge](#)
- [Checking the Status of Spanning-Tree Instance Interfaces on page 89](#)

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](#)
- [Configuring Layer 2 Protocol Tunneling](#)
- [Clearing a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 91](#)

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*
- *Configuring Layer 2 Protocol Tunneling*
- [Checking for a MAC Rewrite Error Condition Blocking a Spanning-Tree Instance Interface on page 90](#)

CHAPTER 8

Operational Mode Commands for Basic Spanning-Tree Configuration

- `clear spanning-tree protocol-migration`
- `show spanning-tree bridge`
- `show spanning-tree interface`
- `show spanning-tree mstp configuration`

clear spanning-tree protocol-migration

Syntax	<code>clear spanning-tree protocol-migration</code> <code><interface <i>interface-name</i>></code> <code><routing-instance <i>routing-instance-name</i>></code>
Release Information	Command introduced in Junos OS Release 9.0.
Description	Revert from the original IEEE 802.1D Spanning Tree Protocol (STP) back to the Rapid Spanning Tree Protocol after the force-version statement has been removed from the configuration.
Options	none —Reset the STP protocol for all interfaces and all routing instances. interface <i>interface-name</i> —(Optional) Reset the STP protocol for the specified interface only. routing-instance <i>routing-instance-name</i> —(Optional) Reset the STP protocol for a particular routing instance.
Additional Information	For information about the force-version statement, see the <i>Junos Routing Protocols Configuration Guide</i> .
Required Privilege Level	clear

Sample Output

clear spanning-tree protocol-migration

```
user@host> clear spanning-tree protocol-migration
```

show spanning-tree bridge

List of Syntax	Syntax on page 95 Syntax (QFX Series) on page 95
Syntax	<pre>show spanning-tree bridge <brief detail> <msti <i>msti-id</i>> <routing-instance <i>routing-instance-name</i>> <vlan-id <i>vlan-id</i>></pre>
Syntax (QFX Series)	<pre>show spanning-tree bridge <brief detail> <msti <i>msti-id</i>> <vlan-id <i>vlan-id</i>></pre>
Release Information	<p>Command introduced in Junos OS Release 8.4.</p> <p>Command introduced in Junos OS Release 11.1 for the QFX Series.</p>
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 96 show spanning-tree bridge msti on page 97 show spanning-tree bridge vlan-id (MSTP) on page 98 show spanning-tree bridge (RSTP) on page 98 show spanning-tree bridge vlan-id (RSTP) on page 99
Output Fields	<p>Table 4 on page 95 lists the output fields for the show spanning-tree bridge command. Output fields are listed in the approximate order in which they appear.</p>

Table 4: 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.

Table 4: show spanning-tree bridge Output Fields (*continued*)

Field Name	Field Description
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.
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
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
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

List of Syntax	Syntax on page 100 Syntax (EX Series Switches and the QFX Series) on page 100
Syntax	<pre>show spanning-tree interface <brief detail> <msti <i>msti-id</i>> <routing-instance <i>routing-instance-name</i>> <vlan-id <i>vlan-id</i>></pre>
Syntax (EX Series Switches and the QFX Series)	<pre>show spanning-tree interface <brief detail> <msti <i>msti-id</i>> <vlan-id <i>vlan-id</i>></pre>
Release Information	<p>Command introduced in Junos OS Release 8.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Command introduced in Junos OS Release 11.1 for the QFX Series.</p>
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 101 show spanning-tree interface (QFX Series) on page 102 show spanning-tree interface detail on page 102 show spanning-tree interface msti on page 104 show spanning-tree interface vlan-id on page 104 show spanning-tree interface (VSTP) on page 105 show spanning-tree interface vlan-id (VSTP) on page 105
Output Fields	<p>Table 5 on page 100 lists the output fields for the show spanning-tree interface command. Output fields are listed in the approximate order in which they appear.</p>

Table 5: 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 5: 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

List of Syntax	Syntax on page 106 Syntax (EX Series Switch and the QFX Series) on page 106
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 107 show spanning-tree mstp configuration detail (QFX Series) on page 107
Output Fields	Table 6 on page 106 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 6: 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
```


CHAPTER 9

Operational Mode Commands for Spanning-Tree Statistics

- `clear spanning-tree statistics`
- `show spanning-tree statistics`

clear spanning-tree statistics

List of Syntax	Syntax on page 110 Syntax (EX Series Switches and the QFX Series) on page 110
Syntax	<code>clear spanning-tree statistics</code> <code><interface <i>interface-name</i>></code> <code><logical-system <i>logical-system-name</i>></code>
Syntax (EX Series Switches and the QFX Series)	<code>clear spanning-tree statistics</code> <code><interface <i>interface-name</i>></code>
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	Clear Spanning Tree Protocol statistics.
Options	<code>none</code> —Reset STP counters for all interfaces for all routing instances. <code>interface <i>interface-name</i></code> —(Optional) Clear STP statistics for the specified interface only. <code>logical-system <i>logical-system-name</i></code> —(Optional) Clear STP statistics on a particular logical system.
<div> NOTE: The <code>logical-system</code> option is not available on QFabric systems.</div>	
Required Privilege Level	clear
Related Documentation	<ul style="list-style-type: none">show spanning-tree statistics on page 111
List of Sample Output	clear stp statistics on page 110

Sample Output

clear stp statistics

```
user@host> clear stp statistics
```

show spanning-tree statistics

List of Syntax	Syntax on page 111 Syntax (EX Series Switch and the QFX Series) on page 111
Syntax	<pre>show spanning-tree statistics <brief detail> <interface <i>interface-name</i>> <routing-instance <i>routing-instance-name</i>></pre>
Syntax (EX Series Switch and the QFX Series)	<pre>show spanning-tree statistics <brief detail> <interface <i>interface-name</i> vlan <i>vlan-id</i>></pre>
Release Information	<p>Command introduced in Junos OS Release 8.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Command introduced in Junos OS Release 11.1 for QFX Series switches.</p>
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	show spanning-tree statistics routing-instance on page 112 show spanning-tree statistics interface routing-instance detail on page 112
Output Fields	<p>Table 7 on page 111 lists the output fields for the show spanning-tree statistics command. Output fields are listed in the approximate order in which they appear.</p>

Table 7: 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 within a specified interval.
BPDUs received in last 5 secs	Number of BPDUs received within a specified interval.

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

Field Name	Field Description
Interface	Interface for which the statistics are being displayed.
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              : 1396
BPDUs received         : 1027
BPDUs sent in last interval : 5      (duration: 4 sec)
BPDUs received in last interval: 4    (duration: 4 sec)
```

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
```


PART 4

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