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# Junos<sup>®</sup> OS for EX Series Ethernet Switches

## Spanning-Tree Protocols Feature Guide for EX Series Switches

Release

15.1



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# About the Documentation

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- Using the Examples in This Manual on page xi
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## Documentation and Release Notes

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To obtain the most current version of all Juniper Networks<sup>®</sup> 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

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

- EX Series

## Using the Examples in This Manual

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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
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>

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> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"><li>Introduces or emphasizes important new terms.</li><li>Identifies guide names.</li><li>Identifies RFC and Internet draft titles.</li></ul>	<ul style="list-style-type: none"><li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li><li><i>Junos OS CLI User Guide</i></li><li>RFC 1997, <i>BGP Communities Attribute</i></li></ul>
<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@# <b>set system domain-name domain-name</b>
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"><li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li><li>The console port is labeled <b>CONSOLE</b>.</li></ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub &lt;default-metric metric&gt;;</b>
(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.	<b>broadcast   multicast</b>  <b>(string1   string2   string3)</b>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members [ community-ids ]</b>
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop address; 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"><li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li><li>To cancel the configuration, click <b>Cancel</b>.</li></ul>

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 <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

- Online feedback rating system—On any page at the Juniper Networks Technical Documentation site at <http://www.juniper.net/techpubs/index.html>, simply click the stars to rate the content, and use the pop-up form to provide us with information about your experience. Alternately, you can use the online feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>.
- E-mail—Send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net). Include the document or topic name, URL or page number, and software 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 Partner Support Service 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:

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- 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 Trees Overview on page 3](#)



## CHAPTER 1

# Spanning Trees Overview

- [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
- [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
- [Understanding STP for EX Series Switches on page 12](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)
- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16](#)
- [Understanding Loop Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 18](#)
- [Understanding Root Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 19](#)

## Understanding MSTP for EX Series and QFX Series Switches

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Ethernet networks are susceptible to broadcast storms if loops are introduced. However, an Ethernet network needs to include loops because they provide redundant paths in case of a link failure. Spanning-tree protocols address both of these issues because they provide link redundancy while simultaneously preventing undesirable loops.

Spanning-tree protocols intelligently avoid loops in a network by creating a tree topology (spanning tree) of the entire bridged network with only one available path between the tree root and a leaf. All other paths are forced into a standby state. The tree *root* is a switch within the network elected by the STA (spanning-tree algorithm) to use when computing the best path between bridges throughout the network and the root bridge. Frames travel through the network to their destination—a *leaf*. A tree *branch* is a network segment, or link, between bridges. Switches that forward frames through an STP spanning-tree are called *designated bridges*.

Juniper Networks EX Series and QFX Series switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP), and VLAN Spanning Tree Protocol (VSTP). This topic explains MSTP.



**NOTE:** If you are using Junos OS for EX Series and QFX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, you can force the original IEEE 802.1D Spanning Tree Protocol (STP) version to run in place of RSTP or VSTP by setting *force-version*.

This topic describes:

- [MSTP Maps Multiple VLANs on page 4](#)
- [Configuring MSTP Regions on page 5](#)
- [Selecting a Spanning Tree Protocol on page 5](#)

### MSTP Maps Multiple VLANs

MSTP is an extension of RSTP that maps multiple independent spanning-tree instances onto one physical topology. Each spanning-tree instance (STI) includes one or more VLANs. Unlike in STP and RSTP configurations, a port might belong to multiple VLANs and be dynamically blocked in one spanning-tree instance, but forwarding in another. This behavior significantly improves network resource utilization by load-balancing across the network and maintaining switch CPU loads at moderate levels. MSTP also leverages the fast reconvergence time of RSTP when a network, switch, or port failure occurs within a spanning-tree instance.

MSTP creates a common and internal spanning tree (CIST) to interconnect and manage all MSTP regions and even individual devices that run RSTP or STP, which are recognized as distinct spanning-tree regions by MSTP. The CIST views each MSTP region as a virtual bridge, regardless of the actual number of devices participating in the MSTP region, and enables multiple spanning-tree instances (MSTIs) to link to other regions. The CIST is a

single topology that connects all switches (STP, RSTP, and MSTP devices) through an active topology, ensuring connectivity between LANs and devices within a bridged network. This functionality provided by MSTP enables you to better utilize network resources while remaining backward-compatible with older network devices.

## Configuring MSTP Regions

When enabling MSTP, you define one or more MSTP regions. An MSTP region defines a logical domain where multiple spanning-tree instances (MSTIs) can be administered independently of MSTIs in other regions, setting the boundary for bridge protocol data units (BPDUs) sent by one MSTI. An MSTP region is a group of switches that is defined by three parameters:

- Region name—User-defined alphanumeric name for the region.
- Revision level—User-defined value that identifies the region.
- Mapping table—Numerical digest of VLAN-to-instance mappings.

An MSTP region can support up to 64 MSTIs,, and each MSTI can support from 1 to 4094 VLANs. When you define a region, MSTP automatically creates an internal spanning-tree instance (IST instance 0) that provides the root switch for the region and includes all currently configured VLANs that are not specifically assigned to a user-defined MSTI. An MSTI includes all static VLANs that you specifically add to it. The switch places any dynamically created VLANs in the IST instance by default, unless you explicitly map them to another MSTI. Once you assign a VLAN to a user-defined MSTI, the switch removes the VLAN from the IST instance.

## Selecting a Spanning Tree Protocol

The default factory configuration for EX Series switches is RSTP, a faster version of STP. To determine which spanning-tree protocol is best for your situation, see [Table 3 on page 5](#) below.

**Table 3: Selecting a Spanning Tree Protocol**

Protocol	Advantages	Disadvantages
RSTP	<ul style="list-style-type: none"> <li>• Rapid Spanning Tree Protocol is the default switch configuration and is recommended for most network configurations because it converges more quickly than STP after a failure.</li> <li>• Voice and video work better with RSTP than they do with STP.</li> <li>• RSTP is backward compatible with STP; therefore, switches do not all have to run RSTP.</li> </ul>	<ul style="list-style-type: none"> <li>• RSTP does not work with 802.1D 1998 bridges.</li> <li>• RSTP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> </ul>

Table 3: Selecting a Spanning Tree Protocol (*continued*)

Protocol	Advantages	Disadvantages
STP	<ul style="list-style-type: none"> <li>Spanning Tree Protocol works with 802.1D 1998 bridges.</li> <li>RSTP is backward compatible with STP; therefore, switches do not all have to run STP.</li> </ul>	<ul style="list-style-type: none"> <li>STP is slower than RSTP.</li> <li>STP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> <li>If you are using Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, you can force the original IEEE 802.1D Spanning Tree Protocol (STP) version to run in place of RSTP or VSTP by setting <i>force-version</i>. However, the CLI does not include <b>[edit protocols stp]</b>.</li> </ul>
MSTP	<ul style="list-style-type: none"> <li>Multiple Spanning Tree Protocol works with most VLANs.</li> <li>RSTP and STP are recognized as distinct spanning-tree regions by MSTP.</li> </ul>	<ul style="list-style-type: none"> <li>Some protocols require compatibility that is not provided by MSTP. In this case, use VSTP.</li> <li>MSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> </ul>
VSTP	<ul style="list-style-type: none"> <li>VLAN Spanning Tree Protocol works with VLANs that require device compatibility.</li> <li>VSTP and RSTP are the only spanning-tree protocols that can be configured concurrently on a switch.</li> </ul>	<ul style="list-style-type: none"> <li>With VSTP there can be only STP instance per VLAN, whereas MSTP lets you combine multiple VLANs in one instance.</li> <li>VSTP supports a limited number of ports compared to RSTP.</li> <li>VSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> <li>Having a large number of VSTP and RSTP instances can cause continuous changes in the topology. Ensure to check the scale limits before configuring large number of VSTP instances.</li> </ul>

- Related Documentation**
- [Understanding STP for EX Series Switches on page 12](#)
  - [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
  - [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)
  - [Understanding Layer 2 Protocol Tunneling on EX Series Switches](#)
  - [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
  - [Example: Configuring Network Regions for VLANs with MSTP](#)
  - [Configuring MSTP](#)

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## Understanding RSTP for EX Series and QFX Series Switches

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Ethernet networks are susceptible to broadcast storms if loops are introduced. However, an Ethernet network needs to include loops because they provide redundant paths in case of a link failure. Spanning-tree protocols address both of these issues because they provide link redundancy while simultaneously preventing undesirable loops. Rapid Spanning Tree Protocol (RSTP) is the default spanning-tree protocol for preventing loops on Ethernet networks.

This topic describes:

- [Spanning Tree Protocols Help Prevent Broadcast Storms on page 7](#)
- [RSTP is an Enhancement of the Original STP on page 7](#)
- [Port Roles Determine Participation in the Spanning Tree on page 8](#)
- [Port States Determine How a Port Processes a Frame on page 8](#)
- [Edge Ports Connect to Devices That Cannot Be Part of a spanning tree on page 8](#)
- [BPDUs Maintain the spanning tree on page 9](#)
- [When an RSTP Root Bridge Fails on page 9](#)
- [Switches Must Relearn MAC Addresses After a Link Failure on page 10](#)
- [Selecting a Spanning Tree Protocol on page 10](#)

### Spanning Tree Protocols Help Prevent Broadcast Storms

Spanning-tree protocols intelligently avoid loops in a network by creating a tree topology (spanning tree) of the entire bridged network with only one available path between the tree root and a leaf. All other paths are forced into a standby state. The tree *root* is a switch within the network elected by the STA (spanning-tree algorithm) to use when computing the best path between bridges throughout the network and the root bridge. Frames travel through the network to their destination—a *leaf* such as an end-user PC—along branches. A tree *branch* is a network segment, or link, between bridges. Switches that forward frames through an STP spanning-tree are called *designated bridges*.

Juniper Networks EX Series and QFX Series switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP), and VLAN Spanning Tree Protocol (VSTP). This topic explains the spanning-tree default RSTP.



**NOTE:** If you are using Junos OS for EX Series and QFX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, you can force the original IEEE 802.1D Spanning Tree Protocol (STP) version to run in place of RSTP or VSTP by setting *force-version*.

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### RSTP is an Enhancement of the Original STP

RSTP evolved from the original STP IEEE 802.1D protocol to provide faster spanning-tree reconvergence after a switch port, switch, or LAN failure. Where STP took up to 50

seconds to respond to topology changes, RSTP responds to changes within the timeframe of three hello BPDUs (bridge protocol data units), or 6 seconds. This is the primary reason that RSTP is the default configuration on EX Series switches. In addition, note that EX Series switches configured to use STP actually run RSTP force version 0, which is compatible with STP.

## Port Roles Determine Participation in the Spanning Tree

Each port has both a role and a state. A port's *role* determines how it participates in the spanning tree. The five port roles used in RSTP are:

- Root port—The port closest to the root bridge (has the lowest path cost from a bridge). This is the only port that receives frames from and forwards frames to the root bridge.
- Designated port—The port that forwards traffic away from the root bridge toward a leaf. A designated bridge has one designated port for every link connection it serves. A root bridge forwards frames from all of its ports, which serve as designated ports.
- Alternate port—A port that provides an alternate path toward the root bridge if the root port fails and is placed in the discarding state. This port is not part of the active spanning-tree, but if the root port fails, the alternate port immediately takes over.
- Backup port—A port that provides a backup path toward the leaves of the spanning tree if a designated port fails and is placed in the discarding state. A backup port can exist only where two or more bridge ports connect to the same LAN for which the bridge serves as the designated bridge. A backup port for a designated port immediately takes over if the port fails.
- Disabled port—The port is not part of the active spanning tree.

## Port States Determine How a Port Processes a Frame

Each port has both a state and a role. A port's *state* determines how it processes a frame. RSTP places each port of a designated bridge in one of three states:

- Discarding—The port discards all BPDUs. A port in this state discards all frames it receives and does not learn MAC addresses.
- Learning—The port prepares to forward traffic by examining received frames for location information in order to build its MAC address table.
- Forwarding—The port filters and forwards frames. A port in the forwarding state is part of the active spanning-tree.

## Edge Ports Connect to Devices That Cannot Be Part of a spanning tree

RSTP also defines the concept of an *edge port*, which is a designated port that connects to devices that are not STP-capable, such as PCs, servers, routers, or hubs that are not connected to other switches. Because edge ports connect directly to end stations, they cannot create network loops and can transition to the forwarding state immediately. You can manually configure edge ports, and a switch can also detect edge ports by noting the absence of communication from the end stations.



The edge ports themselves do send BPDUs to the spanning tree. If you have a good understanding of the implications on your network and want to modify RSTP on the edge port interface.

## BPDUs Maintain the spanning tree

Spanning-tree protocols use frames called bridge protocol data units (BPDUs) to create and maintain the spanning-tree. A BPDU frame is a message sent from one switch to another to communicate information about itself, such as its bridge ID, root path costs, and port MAC addresses. The initial exchange of BPDUs between switches determines the root bridge. Simultaneously, BPDUs are used to communicate the cost of each link between branch devices, which is based upon port speed or user configuration. RSTP uses this path cost to determine the ideal route for data frames to travel from one leaf to another leaf and then blocks all other routes. If an edge port receives a BPDU, it automatically transitions to a regular RSTP port.

When the network is in a steady state, the spanning-tree converges when the spanning-tree algorithm (STA) identifies both the root and designated bridges and all ports are in either a forwarding or blocking state. To maintain the tree, the root bridge continues to send BPDUs at a *hello time* interval (default 2 seconds). These BPDUs continue to communicate the current tree topology. When a port receives a hello BPDU, it compares the information to that already stored for the receiving port. One of three actions takes place when a switch receives a BPDU:

- If the BPDU data matches the existing entry in the MAC address table, the port resets a timer called *max age* to zero and then forwards a new BPDU with the current active topology information to the next port in the spanning-tree.
- If the topology in the BPDU has been changed, the information is updated in the MAC address table, *max age* is again set to zero, and a new BPDU is forwarded with the current active topology information to the next port in the spanning-tree.
- When an RSTP port does not receive a BPDU for three hello times, it reacts one of two ways. If the port is the root port, a complete rework of the spanning tree occurs—see *When an RSTP Root Bridge Fails*. If the bridge is any non-root bridge, RSTP detects that the connected device cannot send BPDUs and converts that port to an edge port.

## When an RSTP Root Bridge Fails

When a link to the root port goes down, a flag called a topology change notification (TCN) is added to the BPDU. When this BPDU reaches the next port in the VLAN, the MAC address table is flushed and the BPDU is sent to the next bridge. Eventually, all ports in the VLAN have flushed their MAC address tables. Then, RSTP configures a new root port.

After a root port or a designated port fails, the alternate or backup port takes over after an exchange of BPDUs called the proposal-agreement handshake. RSTP propagates this handshake over *point-to-point links*, which are dedicated links between two network nodes, or switches, that connect one port to another. If a local port becomes a new root or designated port, it negotiates a rapid transition with the receiving port on the nearest neighboring switch by using the proposal-agreement handshake to ensure a loop-free topology.

## Switches Must Relearn MAC Addresses After a Link Failure

Because a link failure causes all associated ports to flush their MAC address table, the network might be slower as it floods to relearn the MAC addresses. There is a way to speed up this relearning process. During TCN propagation, the Layer 2 forwarding table of switches is flushed, resulting in a flood of data packets. The Address Resolution Protocol (ARP) feature causes the switch to proactively send ARP requests for IP addresses in the ARP cache (present because of Layer 3 VLAN interface). With ARP on STP enabled, as the reply comes through, the switches build up the Layer 2 forwarding table, thus limiting the flooding later. Enabling ARP on STP is most useful to prevent excessive flooding in large Layer 2 networks using RVIs.



**NOTE:** The ARP feature is not available on Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style.

## Selecting a Spanning Tree Protocol

The default factory configuration for EX Series switches is RSTP, a faster version of the original STP. To determine which spanning-tree protocol is best for your situation, see [Table 4 on page 10](#) below.

**Table 4: Selecting a Spanning Tree Protocol**

Protocol	Advantages	Disadvantages
RSTP	<ul style="list-style-type: none"> <li>Rapid Spanning Tree Protocol is the default switch configuration and is recommended for most network configurations because it converges more quickly than STP after a failure.</li> <li>Voice and video work better with RSTP than they do with STP.</li> <li>RSTP is backward compatible with STP; therefore, switches do not all have to run RSTP.</li> <li>RSTP supports more ports than MSTP or VSTP</li> </ul>	<ul style="list-style-type: none"> <li>RSTP does not work with 802.1D 1998 bridges.</li> <li>RSTP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> </ul>
STP	<ul style="list-style-type: none"> <li>Spanning Tree Protocol works with 802.1D 1998 bridges.</li> <li>RSTP is backward compatible with STP; therefore, switches do not all have to run STP.</li> </ul>	<ul style="list-style-type: none"> <li>STP is slower than RSTP.</li> <li>STP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> </ul>
MSTP	<ul style="list-style-type: none"> <li>Multiple Spanning Tree Protocol works with most VLANs.</li> <li>RSTP and STP are recognized as distinct spanning-tree regions by MSTP.</li> </ul>	<ul style="list-style-type: none"> <li>Some protocols require compatibility that is not provided by MSTP. In this case, use VSTP.</li> <li>MSTP supports a limited number of ports.</li> <li>MSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> </ul>

Table 4: Selecting a Spanning Tree Protocol (*continued*)

Protocol	Advantages	Disadvantages
VSTP	<ul style="list-style-type: none"> <li>VLAN Spanning Tree Protocol works with VLANs that require device compatibility.</li> <li>VSTP and RSTP are the only spanning-tree protocols that can be configured concurrently on a switch.</li> </ul>	<ul style="list-style-type: none"> <li>With VSTP there can be only STP instance per VLAN, whereas MSTP lets you combine multiple VLANs in one instance.</li> <li>VSTP supports a limited number of ports compared to RSTP.</li> <li>VSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> <li>Having a large number of VSTP and RSTP instances can cause continuous changes in the topology. As a workaround, reduce the number of VSTP instances to fewer than 190.</li> </ul>

- Related Documentation**
- [Understanding STP for EX Series Switches on page 12](#)
  - [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
  - [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)
  - [Understanding Layer 2 Protocol Tunneling on EX Series Switches](#)
  - [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
  - [Example: Configuring Faster Convergence and Improved Network Stability with RSTP](#)
  - [Configuring RSTP \(CLI Procedure\)](#)

## Understanding STP for EX Series Switches

Ethernet networks are susceptible to broadcast storms if loops are introduced. However, an Ethernet network should always include loops because they provide redundant paths in case of a link failure. Spanning-tree protocols address both of these issues because they provide link redundancy while simultaneously preventing undesirable loops.

Juniper Networks EX Series Ethernet Switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP), and VLAN Spanning Tree Protocol (VSTP). Configure STP when you need to support older 802.1D 1998 bridges. However, note that EX Series switches configured to use STP actually run RSTP force version 0, which is compatible with STP. For an explanation of RSTP, see [“Understanding RSTP for EX Series and QFX Series Switches” on page 7](#)



**NOTE:** If you are using Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, you can force the original IEEE 802.1D Spanning Tree Protocol (STP) version to run in place of RSTP or VSTP by setting *force-version*.

This topic describes:

- [Selecting a Spanning-Tree Protocol on page 12](#)

### Selecting a Spanning-Tree Protocol

The default factory configuration for EX Series switches is RSTP, a faster version of STP. To determine which spanning-tree protocol is best for your situation, see [Table 5 on page 12](#) below.

**Table 5: Selecting a Spanning-Tree Protocol**

Protocol	Advantages	Disadvantages
RSTP	<ul style="list-style-type: none"> <li>• Rapid Spanning Tree Protocol is the default switch configuration and is recommended for most network configurations because it converges more quickly than STP after a failure.</li> <li>• Voice and video work better with RSTP than they do with STP.</li> <li>• RSTP is backward compatible with STP; therefore, switches do not all have to run RSTP.</li> <li>• RSTP supports more ports than MSTP or VSTP</li> </ul>	<ul style="list-style-type: none"> <li>• RSTP does not work with 802.1D 1998 bridges.</li> <li>• RSTP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> </ul>

Table 5: Selecting a Spanning-Tree Protocol (*continued*)

Protocol	Advantages	Disadvantages
STP	<ul style="list-style-type: none"> <li>Spanning Tree Protocol works with 802.1D 1998 bridges.</li> <li>RSTP is backward compatible with STP; therefore, switches do not all have to run STP.</li> </ul>	<ul style="list-style-type: none"> <li>STP is slower than RSTP.</li> <li>STP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> <li>Edge ports are not supported when the original IEEE 802.1D STP is configured.</li> </ul> <p><b>NOTE:</b> If you specify <b>edge</b> at the <b>[edit protocols stp]</b> hierarchy level, the software ignores the option.</p>
MSTP	<ul style="list-style-type: none"> <li>Multiple Spanning Tree Protocol works with most VLANs.</li> <li>RSTP and STP are recognized as distinct spanning-tree regions by MSTP.</li> </ul>	<ul style="list-style-type: none"> <li>Some protocols require compatibility that is not provided by MSTP. In this case, use VSTP.</li> <li>MSTP supports a limited number of ports.</li> <li>MSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> </ul>
VSTP	<ul style="list-style-type: none"> <li>VLAN Spanning Tree Protocol works with VLANs that require device compatibility.</li> <li>VSTP and RSTP are the only spanning-tree protocols that can be configured concurrently on a switch.</li> </ul>	<ul style="list-style-type: none"> <li>With VSTP there can be only STP instance per VLAN, whereas MSTP lets you combine multiple VLANs in one instance.</li> <li>VSTP supports a limited number of ports compared to RSTP.</li> <li>VSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> <li>Having a large number of VSTP and RSTP instances can cause continuous changes in the topology. As a workaround, reduce the number of VSTP instances to fewer than 190.</li> </ul>

- Related Documentation**
- [Configuring STP \(CLI Procedure\) on page 81](#)
  - [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
  - [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
  - [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)
  - [Understanding Layer 2 Protocol Tunneling on EX Series Switches](#)

## Understanding VSTP for EX Series Switches and QFX Series Switches

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Juniper Networks EX Series Ethernet Switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP), and VLAN Spanning Tree Protocol (VSTP). The default factory configuration for EX Series switches uses RSTP. If you use VLANs, however, we recommend that you enable MSTP unless your network requires the device compatibility provided by VSTP. Switches configured to run VSTP automatically assign each VLAN to one spanning-tree instance that runs RSTP. While this approach is useful to optimize network usage in small networks with a limited number of VLANs, a VSTP configuration in a network with several hundred VLANs can overload switch CPUs. MSTP ensures that your network is not slowed down by the increased network traffic caused by hundreds of VLANs, each with its own spanning-tree instance.

VSTP and RSTP are the only spanning-tree protocols that can be configured concurrently on a switch. The maximum number of VLANs that can be supported by VSTP depends upon whether you are using Junos OS for EX Series and QFX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style or Junos OS that does not support ELS. For ELS details, see *Getting Started with Enhanced Layer 2 Software*. For additional VLANs, use RSTP.

- On EX Series (other than EX9200) and QFX switches running Junos OS that supports ELS—VSTP can support up to 510 VLANs. However, on EX9200 switches, VSTP can support only up to 253 VLANs.
- On an EX Series switch running Junos OS that does not support ELS—VSTP can support up to 253 VLANs.



**NOTE:** When you configure VSTP, we recommend that you enable VSTP on all VLANs that can receive VSTP bridge protocol data units (BPDUs).

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**NOTE:** When you configure VSTP with the `set protocol vstp vlan all` command, VLAN ID 1 is not set; it is excluded so that the configuration is compatible with Cisco PVST+. If you want VLAN ID 1 to be included in the VSTP configuration on your switch, you must set it separately with the `set protocol vstp vlan 1` command.

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**NOTE:** The `vlan all` option is supported on all EX Series and QFX Series switches.

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## Selecting a Spanning Tree Protocol

The default factory configuration for EX Series switches is RSTP, a faster version of STP. To determine which spanning-tree protocol is best for your situation, see [Table 6 on page 15](#).

**Table 6: Selecting a Spanning Tree Protocol**

Protocol	Advantages	Disadvantages
RSTP	<ul style="list-style-type: none"> <li>Rapid Spanning Tree Protocol is the default switch configuration and is recommended for most network configurations because it converges more quickly than STP after a failure.</li> <li>Voice and video work better with RSTP than they do with STP.</li> <li>RSTP is backward compatible with STP so switches do not all have to run RSTP.</li> <li>RSTP supports more ports than MSTP or VSTP.</li> </ul>	<ul style="list-style-type: none"> <li>RSTP does not work with 802.1D 1998 bridges.</li> <li>RSTP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning tree. This limits the number of forwarding paths for data traffic.</li> </ul>
STP	<ul style="list-style-type: none"> <li>Spanning Tree Protocol works with 802.1D 1998 bridges.</li> <li>RSTP is backward compatible with STP so switches do not all have to run STP.</li> </ul>	<ul style="list-style-type: none"> <li>STP is slower than RSTP.</li> <li>STP is not recommended for multiple VLAN networks because it is not VLAN-aware—as a result, all VLANs within a LAN share the same spanning-tree. This limits the number of forwarding paths for data traffic.</li> </ul>
MSTP	<ul style="list-style-type: none"> <li>Multiple Spanning Tree Protocol works with most VLANs.</li> <li>RSTP and STP are recognized as distinct Spanning Tree regions by MSTP.</li> </ul>	<ul style="list-style-type: none"> <li>Some protocols require compatibility that is not provided by MSTP. In this case, use VSTP.</li> <li>MSTP supports a limited number of ports.</li> <li>MSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> </ul>
VSTP	<ul style="list-style-type: none"> <li>VLAN Spanning Tree Protocol works with VLANs that require device compatibility.</li> <li>VSTP and RSTP are the only spanning-tree protocols that can be configured concurrently on a switch.</li> </ul>	<ul style="list-style-type: none"> <li>With VSTP there can be only STP instance per VLAN, whereas MSTP lets you combine multiple VLANs in one instance.</li> <li>VSTP supports a limited number of ports compared to RSTP.</li> <li>VSTP uses more CPU than RSTP and does not converge as fast as RSTP.</li> </ul>

- Related Documentation**
- [Understanding STP for EX Series Switches on page 12](#)
  - [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
  - [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
  - [Understanding Layer 2 Protocol Tunneling on EX Series Switches](#)
  - [Configuring VSTP \(CLI Procedure\) on page 87](#)
  - [Configuring VLAN Spanning-Tree Protocol](#)

## Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches

Networks frequently use multiple protocols simultaneously to achieve different goals and in some cases those protocols might conflict with each other. One such case is when spanning-tree protocols are active on the network, where a special type of switching frame called a bridge protocol data unit (BPDU) can conflict with BPDUs generated on other devices such as PCs. The different kinds of BPDUs are not compatible, but they can still be recognized by other devices that use BPDUs and cause network outages. You need to protect any device that recognizes BPDUs from picking up incompatible BPDUs.

- [Different Kinds of BPDUs on page 16](#)
- [Protecting Switches from Incompatible BPDUs on page 16](#)

### Different Kinds of BPDUs

Spanning-tree protocols such as Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), and Multiple Spanning Tree Protocol (MSTP) generate their own BPDUs. These peer STP applications use their BPDUs to communicate, and ultimately, the exchange of BPDUs determines which interfaces block traffic and which interfaces become root ports and forward traffic.

User bridge applications running on a PC can also generate BPDUs. If these BPDUs are picked up by STP applications running on the switch, they can trigger STP miscalculations, and those miscalculations can lead to network outages. Similarly, BPDUs generated by STP protocols can cause problems if they are picked up by devices such as PCs that are not using STP. Some mechanism for BPDU protection must be implemented in these cases.

### Protecting Switches from Incompatible BPDUs

To protect the state of spanning-tree protocols on switches from outside BPDUs, enable BPDU protection on the interfaces of a switch on which spanning-tree protocols are configured and are connected to user devices (such as PCs)—for example, on edge ports connected to PCs. Use the same strategy when a device on which STP is not configured is connected to a switch through a trunk interface that forwards BPDUs generated by spanning-tree protocols. In this case, you protect the device from BPDUs generated by the STP on the switch.

To prevent a switch from forwarding BPDUs generated by spanning-tree protocols to a device, you can enable **bpdu-block** on an interface.

- On Juniper Networks EX Series Ethernet Switches that run Juniper Networks Junos operating system (Junos OS) that supports the Enhanced Layer 2 Software (ELS) configuration style, enable **bpdu-block** at the **[edit protocols layer2-control ]** hierarchy level. To clear the BPDU error, use **clear error bpdu interface**.
- On EX Series switches that run Junos OS that does not support the ELS configuration style, enable **bpdu-block** at the **[edit ethernet-switching-options]** hierarchy level. To clear the BPDU error, use [clear bpdu-error](#)



When an interface configured with BPDU protection encounters an incompatible BPDU, it drops that BPDU and then, either shuts down or continues to receive packets other than spanning-tree protocol BPDUs depending on the configuration defined in the **bpdu-block** statement. If the interface continues to be open after dropping all incompatible BPDUs, all packets except incompatible BPDUs continue to ingress and egress through the interface.

If the interface shuts down after dropping all BPDUs, you can re-enable the interface as follows:

- On Juniper Networks EX Series and QFX Series switches running Juniper Networks Junos operating system (Junos OS) that supports the Enhanced Layer 2 Software (ELS) configuration style:
  - Include the **disable-timeout** statement at the **[edit protocols layer2-control bpdu-block]** hierarchy level to enable the interfaces to automatically return to service when the specified timer expires.
  - Issue the operational mode command **clear error bpdu interface** on the switch.
- On EX Series switches running Junos OS that does not support the ELS configuration style:
  - Include the **disable-timeout** statement at the **[edit ethernet-switching-options bpdu-block]** hierarchy level to enable the interfaces to automatically return to service when the specified timer expires.
  - Issue the operational mode command **clear bpdu-error** on the switch.

#### Related Documentation

- *Configuring BPDU Protection on Spanning Tree Interfaces*
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
- *Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations*
- *Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches*
- [Understanding Loop Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 18](#)
- [Understanding Root Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 19](#)

## Understanding Loop Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches

Juniper Networks EX Series Ethernet Switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), and Multiple Spanning Tree Protocol (MSTP). Loop protection increases the efficiency of STP, RSTP, and MSTP by preventing ports from moving into a forwarding state that would result in a loop opening up in the network.

A loop-free network in spanning-tree topologies is supported through the exchange of a special type of frame called bridge protocol data unit (BPDU). Peer STP applications running on the switch interfaces use BPDUs to communicate. Ultimately, the exchange of BPDUs determines which interfaces block traffic (preventing loops) and which interfaces become root ports and forward traffic.

However, a blocking interface can transition to the forwarding state in error if the interface stops receiving BPDUs from its designated port on the segment. Such a transition error can occur when there is a hardware error on the switch or software configuration error between the switch and its neighbor.

When loop protection is enabled, the spanning-tree topology detects root ports and blocked ports and makes sure both keep receiving BPDUs. If a loop-protection-enabled interface stops receiving BPDUs from its designated port, it reacts as it would react to a problem with the physical connection on this interface. It does not transition the interface to a forwarding state, but instead transitions it to a loop-inconsistent state. The interface recovers and then it transitions back to the spanning-tree blocking state as soon as it receives a BPDU.

We recommend that you enable loop protection on all switch interfaces that have a chance of becoming root or designated ports. Loop protection is most effective when enabled in the entire switched network. When you enable loop protection, you must configure at least one action (**log**, **block**, or both).

Note that an interface can be configured for either loop protection or root protection, but not for both.

### Related Documentation

- [Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71](#)
- [Understanding Root Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 19](#)
- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16](#)
- [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
- [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
- [Understanding STP for EX Series Switches on page 12](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)

## Understanding Root Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches

Juniper Networks EX Series Ethernet Switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), and Multiple Spanning Tree Protocol (MSTP). A loop-free network is supported through the exchange of a special type of frame called bridge protocol data unit (BPDU). Peer STP applications running on the switch interfaces use BPDUs to communicate. Ultimately, the exchange of BPDUs determines which interfaces block traffic and which interfaces become root ports and forward traffic.

However, a root port elected through this process has the possibility of being wrongly elected. A user bridge application running on a PC can generate BPDUs, too, and interfere with root port election. Root protection allows network administrators to manually enforce the root bridge placement in the network.

Enable root protection on interfaces that must not receive superior BPDUs from the root bridge and must not be elected as the root port. These interfaces become designated ports and are typically located on an administrative boundary. If the bridge receives superior STP BPDUs on a port that has root protection enabled, that port transitions to a root-prevented STP state (inconsistency state) and the interface is blocked. This blocking prevents a bridge that should not be the root bridge from being elected the root bridge. After the bridge stops receiving superior STP BPDUs on the interface with root protection, the interface returns to a listening state, followed by a learning state, and ultimately back to a forwarding state. Recovery back to the forwarding state is automatic.

When root protection is enabled on an interface, it is enabled for all the STP instances on that interface. The interface is blocked only for instances for which it receives superior BPDUs. Otherwise, it participates in the spanning-tree topology.

An interface can be configured for either root protection or loop protection, but not for both.

### Related Documentation

- [Configuring BPDU Protection on Spanning Tree Interfaces](#)
- [Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches on page 75](#)
- [Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
- [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
- [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
- [Understanding STP for EX Series Switches on page 12](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)



## PART 2

# Configuration

- [Configuration Examples on page 23](#)
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- [Configuration Statements on page 95](#)



## CHAPTER 2

# Configuration Examples

- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
- [Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71](#)
- [Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches on page 75](#)

### Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches

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EX Series switches use Rapid Spanning Tree Protocol (RSTP) by default to provide a loop-free topology.

When switches that support redundant Routing Engines use RSTP, it is important to keep RSTP synchronized on both Routing Engines so that no loss of service occurs after a Routing Engine switchover. Nonstop bridging protocol keeps Routing Engines synchronized.

This example describes how to configure RSTP and NSB on four EX Series switches:

- [Requirements on page 24](#)
- [Overview and Topology on page 24](#)
- [Configuring RSTP and Nonstop Bridging on Switch 1 on page 26](#)
- [Configuring RSTP and Nonstop Bridging on Switch 2 on page 29](#)
- [Configuring RSTP and Nonstop Bridging on Switch 3 on page 32](#)
- [Configuring RSTP and Nonstop Bridging on Switch 4 on page 35](#)
- [Verification on page 38](#)

## Requirements

This example uses the following hardware and software components:

- Junos OS Release 11.3 or later for EX Series switches
- Four EX Series switches

Before you configure the switches for RSTP, be sure you have:

- Installed the four switches. See *Connecting and Configuring an EX Series Switch (J-Web Procedure)*.
- Performed the initial software configuration on all switches. See *Installing and Connecting an EX3200 Switch*.

## Overview and Topology

RSTP works by identifying certain links as point to point links and blocking other possible paths. When one of the point-to-point links fails, a designated alternate link transitions to the forwarding state and take over. Configuring nonstop bridging (NSB) on a switch with redundant Routing Engines keeps RSTP synchronized on both Routing Engines. This way, RSTP remains active immediately after a switchover because it is already synchronized to the backup Routing Engine. RSTP does not have to reconverge after a Routing Engine switchover when NSB is enabled because the neighbor devices do not detect an RSTP change on the switch. In this example, four EX Series switches are connected in the topology displayed in [Figure 1 on page 25](#) to create a loop-free topology with NSB applied to switches with dual Routing Engines.



Figure 1: Network Topology for RSTP

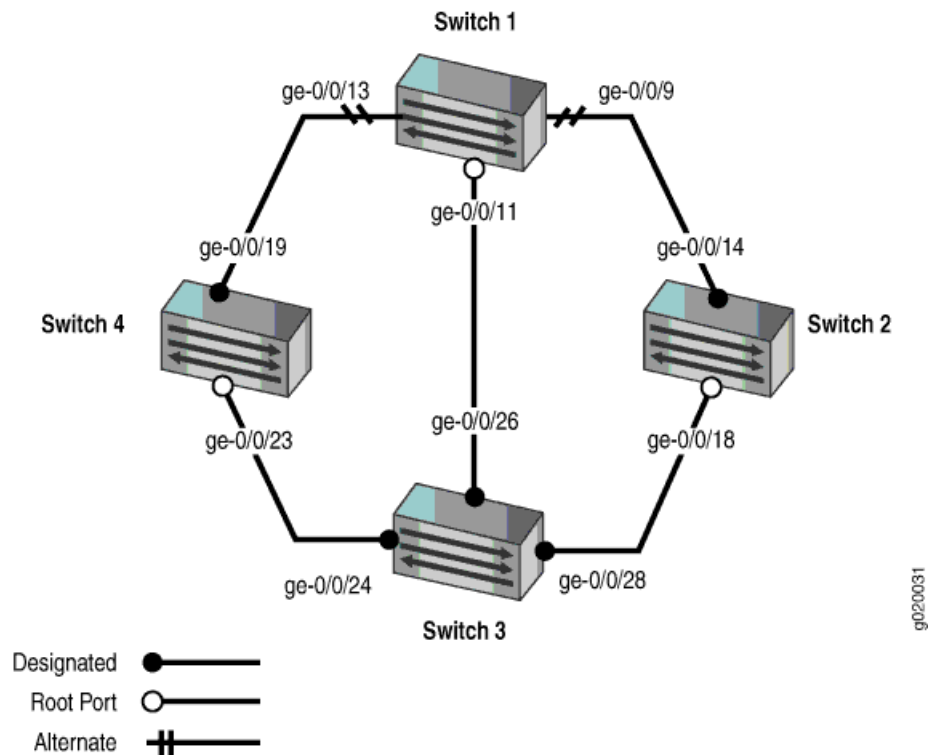


Table 7 on page 25 shows the components of the topology for this example.



**NOTE:** You can configure RSTP on logical or physical interfaces. This example shows RSTP configured on logical interfaces.

Table 7: Components of the Topology for Configuring RSTP

Property	Settings
Switch 1	<p>The following interfaces on Switch 1 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <b>ge-0/0/9</b> is connected to Switch 2</li> <li>• <b>ge-0/0/13</b> is connected to Switch 4</li> <li>• <b>ge-0/0/11</b> is connected to Switch 3</li> </ul>
Switch 2	<p>The following interfaces on Switch 2 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <b>ge-0/0/14</b> is connected to Switch 1</li> <li>• <b>ge-0/0/18</b> is connected to Switch 3</li> </ul>
Switch 3	<p>The following interfaces on Switch 3 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <b>ge-0/0/26</b> is connected to Switch 1</li> <li>• <b>ge-0/0/28</b> is connected to Switch 2</li> <li>• <b>ge-0/0/24</b> is connected to Switch 4</li> </ul>

Table 7: Components of the Topology for Configuring RSTP (*continued*)

Property	Settings
Switch 4	<p>The following interfaces on Switch 4 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <b>ge-0/0/19</b> is connected to Switch 1</li> <li>• <b>ge-0/0/23</b> is connected to Switch 3</li> </ul>
VLAN names and tag IDs	<p><b>voice-vlan</b>, tag 10  <b>employee-vlan</b>, tag 20  <b>guest-vlan</b>, tag 30  <b>camera-vlan</b>, tag 40</p>

This configuration example creates a loop-free topology between four EX Series switches using RSTP.

An RSTP topology contains ports that have specific roles:

- The *root port* is responsible for forwarding data to the root bridge.
- The *alternate port* is a standby port for the root port. When a root port goes down, the alternate port becomes the active root port.
- The *designated port* forwards data to the downstream network segment or device.
- The *backup port* is a backup port for the designated port. When a designated port goes down, the backup port becomes the active designated port and starts forwarding data.



**NOTE:** You also can create a loop-free topology between the aggregation layer and the distribution layer using redundant trunk links. For more information about configuring redundant trunk links, see *Example: Configuring Redundant Trunk Links for Faster Recovery*.

## Configuring RSTP and Nonstop Bridging on Switch 1

**CLI Quick Configuration** To quickly configure RSTP and nonstop bridging on Switch 1, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans voice-vlan description "Voice VLAN"
set vlans voice-vlan vlan-id 10
set vlans employee-vlan description "Employee VLAN"
set vlans employee-vlan vlan-id 20
set vlans guest-vlan description "Guest VLAN"
set vlans guest-vlan vlan-id 30
set vlans camera-vlan description "Camera VLAN"
set vlans camera-vlan vlan-id 40
set interfaces ge-0/0/13 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/9 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/11 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/9 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/11 unit 0 family ethernet-switching port-mode trunk
```

```

set protocols rstp bridge-priority 16k
set protocols rstp interface ge-0/0/13.0 cost 1000
set protocols rstp interface ge-0/0/13.0 mode point-to-point
set protocols rstp interface ge-0/0/9.0 cost 1000
set protocols rstp interface ge-0/0/9.0 mode point-to-point
set protocols rstp interface ge-0/0/11.0 cost 1000
set protocols rstp interface ge-0/0/11.0 mode point-to-point

```

If Switch 1 includes dual Routing Engines, configure NSB. To quickly configure nonstop bridging on Switch 1, copy the following commands and paste them into the switch terminal window:

```

set chassis redundancy graceful switchover
set system commit synchronize
set ethernet-switching-options nonstop-bridging

```

### Step-by-Step Procedure

To configure RSTP and nonstop bridging on Switch 1:

1. Configure the VLANs **voice-vlan**, **employee-vlan**, **guest-vlan**, and **camera-vlan**:

```

[edit vlans]
user@switch1# set voice-vlan description "Voice VLAN"
user@switch1# set voice-vlan vlan-id 10
user@switch1# set employee-vlan description "Employee VLAN"
user@switch1# set employee-vlan vlan-id 20
user@switch1# set guest-vlan description "Guest VLAN"
user@switch1# set guest-vlan vlan-id 30
user@switch1# set camera-vlan description "Camera VLAN"
user@switch1# set camera-vlan vlan-id 40

```

2. Configure the VLANs on the interfaces, including support for the Ethernet switching protocol:

```

[edit interfaces]
user@switch1# set ge-0/0/13 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch1# set ge-0/0/9 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch1# set ge-0/0/11 unit 0 family ethernet-switching vlan members [10 20 30 40]

```

3. Configure the port mode for the interfaces:

```

[edit interfaces]
user@switch1# set ge-0/0/13 unit 0 family ethernet-switching port-mode trunk
user@switch1# set ge-0/0/9 unit 0 family ethernet-switching port-mode trunk
user@switch1# set ge-0/0/11 unit 0 family ethernet-switching port-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch1# rstp bridge-priority 16k
user@switch1# rstp interface ge-0/0/13.0 cost 1000
user@switch1# rstp interface ge-0/0/13.0 mode point-to-point
user@switch1# rstp interface ge-0/0/9.0 cost 1000
user@switch1# rstp interface ge-0/0/9.0 mode point-to-point
user@switch1# rstp interface ge-0/0/11.0 cost 1000
user@switch1# rstp interface ge-0/0/11.0 mode point-to-point

```

### Step-by-Step Procedure

If Switch 1 includes dual Routing Engines, configure nonstop bridging. To configure NSB on Switch 1:

1. Enable graceful Routing Engine switchover (GRES):

- ```
[edit chassis redundancy]
user@switch1# set graceful-switchover
```
2. Configure the switch to always synchronize configuration changes between the Routing Engines:
- ```
[edit system]
user@switch1# set commit synchronize
```
- If you try to commit a configuration in which nonstop bridging is configured but synchronization of configuration changes is not configured, the configuration is not committed.
3. Enable nonstop bridging:
- ```
[edit ethernet-switching-options]
user@switch1# set nonstop-bridging
```



**NOTE:** This process enables NSB for all NSB-supported Layer 2 protocols on the switch, including RSTP.

**Results** Check the results of the configuration:

```
user@switch1> show configuration
interfaces {
  ge-0/0/13 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/9 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/11 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
}
```

```

}
protocols {
  rstp {
    bridge-priority 16k;
    interface ge-0/0/13.0 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/9.0 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/11.0 {
      cost 1000;
      mode point-to-point;
    }
  }
}
}
vlands {
  voice-vlan {
    vlan-id 10;
  }
  employee-vlan {
    vlan-id 20;
  }
  guest-vlan {
    vlan-id 30;
  }
  camera-vlan {
    vlan-id 40;
  }
}
system {
  commit synchronize;
}
chassis {
  redundancy {
    graceful-switchover;
  }
}
ethernet-switching-options {
  nonstop-bridging;
}

```

## Configuring RSTP and Nonstop Bridging on Switch 2

**CLI Quick Configuration** To quickly configure RSTP and nonstop bridging on Switch 2, copy the following commands and paste them into the switch terminal window:

```

[edit]
set vlands voice-vlan description "Voice VLAN"
set vlands voice-vlan vlan-id 10
set vlands employee-vlan description "Employee VLAN"
set vlands employee-vlan vlan-id 20
set vlands guest-vlan description "Guest VLAN"
set vlands guest-vlan vlan-id 30

```

```

set vlans camera-vlan description "Camera VLAN"
set vlans camera-vlan vlan-id 40
set interfaces ge-0/0/14 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/18 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/14 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/18 unit 0 family ethernet-switching port-mode trunk
set protocols rstp bridge-priority 32k
set protocols rstp interface ge-0/0/14.0 cost 1000
set protocols rstp interface ge-0/0/14.0 mode point-to-point
set protocols rstp interface ge-0/0/18.0 cost 1000
set protocols rstp interface ge-0/0/18.0 mode point-to-point

```

If Switch 2 includes dual Routing Engines, configure NSB. To quickly configure nonstop bridging on Switch 2, copy the following commands and paste them into the switch terminal window:

```

set chassis redundancy graceful switchover
set system commit synchronize
set ethernet-switching-options nonstop-bridging

```

#### Step-by-Step Procedure

To configure RSTP and nonstop bridging on Switch 2:

1. Configure the VLANs `voice-vlan`, `employee-vlan`, `guest-vlan`, and `camera-vlan`:

```

[edit vlans]
user@switch2# set voice-vlan description "Voice VLAN"
user@switch2# set voice-vlan vlan-id 10
user@switch2# set employee-vlan description "Employee VLAN"
user@switch2# set employee-vlan vlan-id 20
user@switch2# set guest-vlan description "Guest VLAN"
user@switch2# set guest-vlan vlan-id 30
user@switch2# set camera-vlan description "Camera VLAN"
user@switch2# set camera-vlan vlan-id 40

```

2. Configure the VLANs on the interfaces, including support for the Ethernet switching protocol:

```

[edit interfaces]
user@switch2# set ge-0/0/14 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch2# set ge-0/0/18 unit 0 family ethernet-switching vlan members [10 20 30 40]

```

3. Configure the port mode for the interfaces:

```

[edit interfaces]
user@switch2# set ge-0/0/14 unit 0 family ethernet-switching port-mode trunk
user@switch2# set ge-0/0/18 unit 0 family ethernet-switching port-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch2# rstp bridge-priority 32k
user@switch2# rstp interface ge-0/0/14.0 cost 1000
user@switch2# rstp interface ge-0/0/14.0 mode point-to-point
user@switch2# rstp interface ge-0/0/18.0 cost 1000
user@switch2# rstp interface ge-0/0/18.0 mode point-to-point

```

#### Step-by-Step Procedure

If Switch 2 includes dual Routing Engines, configure nonstop bridging. To configure NSB on Switch 2:

1. Enable graceful Routing Engine switchover (GRES):

```

[edit chassis redundancy]

```

- ```
user@switch2# set graceful-switchover
```
- Configure the switch to always synchronize configuration changes between the Routing Engines:  
  

```
[edit system]
user@switch2# set commit synchronize
```

If you try to commit a configuration in which nonstop bridging is configured but synchronization of configuration changes is not configured, the configuration is not committed.
  - Enable nonstop bridging:  
  

```
[edit ethernet-switching-options]
user@switch2# set nonstop-bridging
```



**NOTE:** This process enables NSB for all NSB-supported Layer 2 protocols on the switch, including RSTP.

**Results** Check the results of the configuration:

```
user@switch2> show configuration
interfaces {
  ge-0/0/14 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/18 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
}
protocols {
  rstp {
    bridge-priority 32k;
    interface ge-0/0/14.0 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/18.0 {
      cost 1000;
      mode point-to-point;
    }
  }
}
```

```
    }  
  }  
}  
vpls {  
  voice-vlan {  
    vlan-id 10;  
  }  
  employee-vlan {  
    vlan-id 20;  
  }  
  guest-vlan {  
    vlan-id 30;  
  }  
  camera-vlan {  
    vlan-id 40;  
  }  
}  
system {  
  commit synchronize;  
}  
chassis {  
  redundancy {  
    graceful-switchover;  
  }  
  ethernet-switching-options {  
    nonstop-bridging;  
  }  
}
```

### Configuring RSTP and Nonstop Bridging on Switch 3

**CLI Quick Configuration** To quickly configure RSTP and nonstop bridging on Switch 3, copy the following commands and paste them into the switch terminal window:

```
[edit]  
set vlans voice-vlan description "Voice VLAN"  
set vlans voice-vlan vlan-id 10  
set vlans employee-vlan description "Employee VLAN"  
set vlans employee-vlan vlan-id 20  
set vlans guest-vlan description "Guest VLAN"  
set vlans guest-vlan vlan-id 30  
set vlans camera-vlan description "Camera VLAN"  
set vlans camera-vlan vlan-id 40  
set interfaces ge-0/0/26 unit 0 family ethernet-switching vlan members [10 20 30 40]  
set interfaces ge-0/0/28 unit 0 family ethernet-switching vlan members [10 20 30 40]  
set interfaces ge-0/0/24 unit 0 family ethernet-switching vlan members [10 20 30 40]  
set interfaces ge-0/0/26 unit 0 family ethernet-switching port-mode trunk  
set interfaces ge-0/0/28 unit 0 family ethernet-switching port-mode trunk  
set interfaces ge-0/0/24 unit 0 family ethernet-switching port-mode trunk  
set protocols rstp bridge-priority 8k  
set protocols rstp interface ge-0/0/26.0 cost 1000  
set protocols rstp interface ge-0/0/26.0 mode point-to-point  
set protocols rstp interface ge-0/0/28.0 cost 1000  
set protocols rstp interface ge-0/0/28.0 mode point-to-point  
set protocols rstp interface ge-0/0/24.0 cost 1000  
set protocols rstp interface ge-0/0/24.0 mode point-to-point
```



If Switch 3 includes dual Routing Engines, configure NSB. To quickly configure nonstop bridging on Switch 3, copy the following commands and paste them into the switch terminal window:

```
set chassis redundancy graceful switchover
set system commit synchronize
set ethernet-switching-options nonstop-bridging
```

#### Step-by-Step Procedure

To configure RSTP and nonstop bridging on Switch 3:

1. Configure the VLANs **voice-vlan**, **employee-vlan**, **guest-vlan**, and **camera-vlan**:  

```
[edit vlans]
user@switch3# set voice-vlan description "Voice VLAN"
user@switch3# set voice-vlan vlan-id 10
user@switch3# set employee-vlan description "Employee VLAN"
user@switch3# set employee-vlan vlan-id 20
user@switch3# set guest-vlan description "Guest VLAN"
user@switch3# set guest-vlan vlan-id 30
user@switch3# set camera-vlan description "Camera VLAN"
user@switch3# set camera-vlan vlan-id 40
```
2. Configure the VLANs on the interfaces, including support for the Ethernet switching protocol:  

```
[edit interfaces]
user@switch3# set ge-0/0/26 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch3# set ge-0/0/28 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch3# set ge-0/0/24 unit 0 family ethernet-switching vlan members [10 20 30 40]
```
3. Configure the port mode for the interfaces:  

```
[edit interfaces]
user@switch3# set ge-0/0/26 unit 0 family ethernet-switching port-mode trunk
user@switch3# set ge-0/0/28 unit 0 family ethernet-switching port-mode trunk
user@switch3# set ge-0/0/24 unit 0 family ethernet-switching port-mode trunk
```
4. Configure RSTP on the switch:  

```
[edit protocols]
user@switch3# rstp bridge-priority 8k
user@switch3# rstp interface ge-0/0/26.0 cost 1000
user@switch3# rstp interface ge-0/0/26.0 mode point-to-point
user@switch3# rstp interface ge-0/0/28.0 cost 1000
user@switch3# rstp interface ge-0/0/28.0 mode point-to-point
user@switch3# rstp interface ge-0/0/24.0 cost 1000
user@switch3# rstp interface ge-0/0/24.0 mode point-to-point
```

#### Step-by-Step Procedure

If Switch 3 includes dual Routing Engines, configure nonstop bridging. To configure NSB on Switch 3:

1. Enable graceful Routing Engine switchover (GRES):  

```
[edit chassis redundancy]
user@switch3# set graceful-switchover
```
2. Configure the switch to always synchronize configuration changes between the Routing Engines:  

```
[edit system]
user@switch3# set commit synchronize
```

If you try to commit a configuration in which nonstop bridging is configured but synchronization of configuration changes is not configured, the configuration is not committed.

3. Enable nonstop bridging:  

```
[edit ethernet-switching-options]  
user@switch3# set nonstop-bridging
```



**NOTE:** This process enables NSB for all NSB-supported Layer 2 protocols on the switch, including RSTP.

**Results** Check the results of the configuration:

```
user@switch3> show configuration  
interfaces {  
  ge-0/0/26 {  
    unit 0 {  
      family ethernet-switching {  
        port-mode trunk;  
        vlan {  
          members [10 20 30 40];  
        }  
      }  
    }  
  }  
  ge-0/0/28 {  
    unit 0 {  
      family ethernet-switching {  
        port-mode trunk;  
        vlan {  
          members [10 20 30 40];  
        }  
      }  
    }  
  }  
  ge-0/0/24 {  
    unit 0 {  
      family ethernet-switching {  
        port-mode trunk;  
        vlan {  
          members [10 20 30 40];  
        }  
      }  
    }  
  }  
}  
protocols {  
  rstp {  
    bridge-priority 8k;  
    interface ge-0/0/26.0 {  
      cost 1000;  
    }  
  }  
}
```

```

        mode point-to-point;
    }
    interface ge-0/0/28.0 {
        cost 1000;
        mode point-to-point;
    }
    interface ge-0/0/24.0 {
        cost 1000;
        mode point-to-point;
    }
    }
    bridge-priority 8k;
    }
}
}
vpls {
    voice-vlan {
        vlan-id 10;
    }
    employee-vlan {
        vlan-id 20;
    }
    guest-vlan {
        vlan-id 30;
    }
    camera-vlan {
        vlan-id 40;
    }
}
system {
    commit synchronize;
}
chassis {
    redundancy {
        graceful-switchover;
    }
}
ethernet-switching-options {
    nonstop-bridging;
}

```

## Configuring RSTP and Nonstop Bridging on Switch 4

**CLI Quick Configuration** To quickly configure RSTP and nonstop bridging on Switch 4, copy the following commands and paste them into the switch terminal window:

```

[edit]
set vpls voice-vlan description "Voice VLAN"
set vpls voice-vlan vlan-id 10
set vpls employee-vlan description "Employee VLAN"
set vpls employee-vlan vlan-id 20
set vpls guest-vlan description "Guest VLAN"
set vpls guest-vlan vlan-id 30
set vpls camera-vlan description "Camera VLAN"
set vpls camera-vlan vlan-id 40
set interfaces ge-0/0/23 unit 0 family ethernet-switching vlan members [10 20 30 40]

```

```

set interfaces ge-0/0/19 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/23 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/19 unit 0 family ethernet-switching port-mode trunk
set protocols rstp bridge-priority 16k
set protocols rstp interface ge-0/0/23.0 cost 1000
set protocols rstp interface ge-0/0/23.0 mode point-to-point
set protocols rstp interface ge-0/0/19.0 cost 1000
set protocols rstp interface ge-0/0/19.0 mode point-to-point

```

If Switch 4 includes dual Routing Engines, configure NSB. To quickly configure nonstop bridging on Switch 4, copy the following commands and paste them into the switch terminal window:

```

set chassis redundancy graceful switchover
set system commit synchronize
set ethernet-switching-options nonstop-bridging

```

#### Step-by-Step Procedure

To configure RSTP and nonstop bridging on Switch 4:

1. Configure the VLANs **voice-vlan**, **employee-vlan**, **guest-vlan**, and **camera-vlan**:

```

[edit vlans]
user@switch4# set voice-vlan description "Voice VLAN"
user@switch4# set voice-vlan vlan-id 10
user@switch4# set employee-vlan description "Employee VLAN"
user@switch4# set employee-vlan vlan-id 20
user@switch4# set guest-vlan description "Guest VLAN"
user@switch4# set guest-vlan vlan-id 30
user@switch4# set camera-vlan description "Camera VLAN"
user@switch4# set camera-vlan vlan-id 40

```

2. Configure the VLANs on the interfaces, including support for the Ethernet switching protocol:

```

[edit interfaces]
user@switch4# set ge-0/0/23 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch4# set ge-0/0/19 unit 0 family ethernet-switching vlan members [10 20 30 40]

```

3. Configure the port mode for the interfaces:

```

[edit interfaces]
user@switch4# set ge-0/0/23 unit 0 family ethernet-switching port-mode trunk
user@switch4# set ge-0/0/19 unit 0 family ethernet-switching port-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch4# rstp bridge-priority 16k
user@switch4# rstp interface all cost 1000
user@switch4# rstp interface ge-0/0/23.0 cost 1000
user@switch4# rstp interface ge-0/0/23.0 mode point-to-point
user@switch4# rstp interface ge-0/0/19.0 cost 1000
user@switch4# rstp interface ge-0/0/19.0 mode point-to-point

```

#### Step-by-Step Procedure

If Switch 4 includes dual Routing Engines, configure nonstop bridging. To configure NSB on Switch 4:

1. Enable graceful Routing Engine switchover (GRES):

```

[edit chassis redundancy]
user@switch4# set graceful-switchover

```

2. Configure the switch to always synchronize configuration changes between the Routing Engines:

```
[edit system]
user@switch4# set commit synchronize
```

If you try to commit a configuration in which nonstop bridging is configured but synchronization of configuration changes is not configured, the configuration is not committed.

3. Enable nonstop bridging:

```
[edit ethernet-switching-options]
user@switch4# set nonstop-bridging
```



**NOTE:** This process enables NSB for all NSB-supported Layer 2 protocols on the switch, including RSTP.

**Results** Check the results of the configuration:

```
user@switch4> show configuration
interfaces {
  ge-0/0/23 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/19 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
}
protocols {
  rstp {
    bridge-priority 16k;
    interface ge-0/0/23.0 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/19.0 {
      cost 1000;
      mode point-to-point;
    }
  }
}
```

```
    }  
  }  
}  
vpls {  
  voice-vlan {  
    vlan-id 10;  
  }  
  employee-vlan {  
    vlan-id 20;  
  }  
  guest-vlan {  
    vlan-id 30;  
  }  
  camera-vlan {  
    vlan-id 40;  
  }  
}  
system {  
  commit synchronize;  
}  
chassis {  
  redundancy {  
    graceful-switchover;  
  }  
}  
ethernet-switching-options {  
  nonstop-bridging;  
}
```

## Verification

To confirm that the configuration is working properly, perform these tasks on both Routing Engines:

- [Verifying RSTP Configuration on Switch 1 on page 38](#)
- [Verifying RSTP Configuration on Switch 2 on page 39](#)
- [Verifying RSTP Configuration on Switch 3 on page 39](#)
- [Verifying RSTP Configuration on Switch 4 on page 40](#)

### Verifying RSTP Configuration on Switch 1

**Purpose** Verify the RSTP configuration on Switch 1.

**Action** Use the operational mode command:

```
user@switch1> 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-0/0/13.0	128:526	128:526	16384.0019e25040e0	1000	BLK	ALT
ge-0/0/9.0	128:522	128:522	32768.0019e2503d20	1000	BLK	ALT
ge-0/0/11.0	128:524	128:524	8192.0019e25051e0	1000	FWD	ROOT

**Meaning** Refer to the topology in [Figure 1 on page 25](#). The operational mode command **show spanning-tree interface** shows that **ge-0/0/13.0** is in a forwarding state. The other interfaces on Switch 1 are blocking.

### Verifying RSTP Configuration on Switch 2

**Purpose** Use this procedure to verify the RSTP configuration on both Switch 2 Routing Engines.

**Action** Use the operational mode command:

```
user@switch2> 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-0/0/14.0	128:527	128:527	32768.0019e2503d20	1000	FWD	DESC
ge-0/0/18.0	128:529	128:529	8192.0019e25051e0	1000	FWD	ROOT

**Meaning** Refer to the topology in [Figure 1 on page 25](#). The operational mode command **show spanning-tree interface** shows that **ge-0/0/18.0** is in a forwarding state and is the root port.

### Verifying RSTP Configuration on Switch 3

**Purpose** Use this procedure to verify the RSTP configuration on both Switch 3 Routing Engines.

**Action** Use the operational mode commands:

```
user@switch3> 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-0/0/26.0	128:539	128:539	8192.0019e25051e0	1000	FWD	DESC
ge-0/0/28.0	128:541	128:541	8192.0019e25051e0	1000	FWD	DESC
ge-0/0/24.0	128:537	128:537	8192.0019e25051e0	1000	FWD	DESC

**Meaning** Refer to the topology in [Figure 1 on page 25](#). The operational mode command **show spanning-tree interface** shows that no interface is the root interface.

### Verifying RSTP Configuration on Switch 4

**Purpose** Use this procedure to verify the RSTP configuration on both Switch 4 Routing Engines.

**Action** Use the operational mode commands:

```
user@switch4> 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-0/0/23.0	128:536	128:536	8192.0019e25051e0	1000	FWD	ROOT
ge-0/0/19.0	128:532	128:532	16384.0019e25040e0	1000	FWD	DESC

**Meaning** Refer to the topology in [Figure 1 on page 25](#). The operational mode command **show spanning-tree interface** shows that interface **ge-0/0/23.0** is the root interface and forwarding.

- Related Documentation**
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
  - [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)

## Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches

Multiple Spanning Tree Protocol (MSTP) is used to create a loop-free topology in networks using multiple spanning-tree regions in which each region contains multiple spanning-tree instances (MSTIs). MSTIs provide different paths for different VLANs. This functionality facilitates better load sharing across redundant links.

Up to 64 MSTIs can be created for an EX Series switch, and each MSTI can support up to 4094 VLANs.



This example describes how to configure MSTP on four EX Series switches:

- [Requirements on page 41](#)
- [Overview and Topology on page 41](#)
- [Configuring MSTP on Switch 1 on page 44](#)
- [Configuring MSTP on Switch 2 on page 47](#)
- [Configuring MSTP on Switch 3 on page 49](#)
- [Configuring MSTP on Switch 4 on page 52](#)
- [Verification on page 54](#)

## Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.0 or later for EX Series switches
- Four EX Series switches

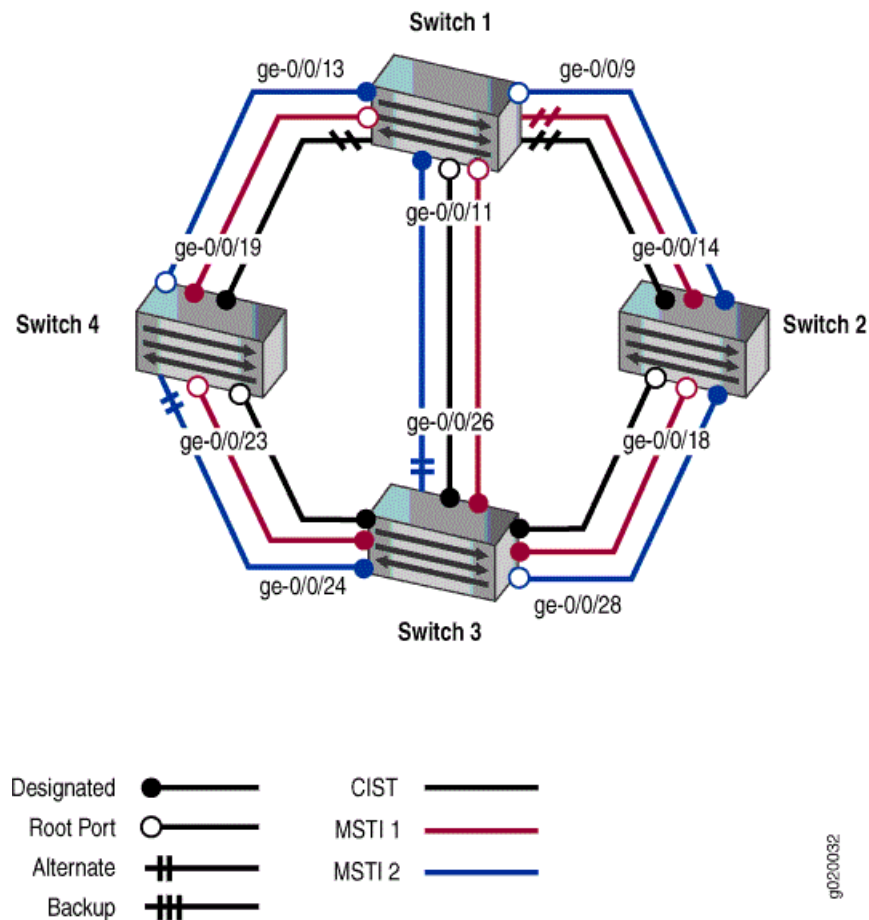
Before you configure the switches for MSTP, be sure you have:

- Installed and connected the four switches. See the hardware documentation for your switch.
- Performed the initial software configuration on all switches. See *Connecting and Configuring an EX Series Switch (CLI Procedure)* or *Connecting and Configuring an EX Series Switch (J-Web Procedure)*.

## Overview and Topology

When the number of VLANs grows in a network, MSTP provides an efficient way of creating a loop-free topology by using MSTIs. Each MSTI in the spanning-tree domain maintains its own tree. Each tree can be mapped to different links, utilizing bandwidth that would be unavailable to a single tree. MSTIs reduce the demand on system resources.

Figure 2: Network Topology for MSTP



The interfaces shown in [Figure 2 on page 42](#) will be configured for MSTP.



**NOTE:** You can configure MSTP on logical or physical interfaces. This example shows configuring MSTP on logical interfaces.

Table 8: Components of the Topology for Configuring MSTP on EX Series Switches

Property	Settings
Switch 1	<p>The following interfaces on Switch 1 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <code>ge-0/0/9</code> is connected to Switch 2</li> <li>• <code>ge-0/0/13</code> is connected to Switch 4</li> <li>• <code>ge-0/0/11</code> is connected to Switch 3</li> </ul>
Switch 2	<p>The following interfaces on Switch 2 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <code>ge-0/0/14</code> is connected to Switch 1</li> <li>• <code>ge-0/0/18</code> is connected to Switch 3</li> </ul>

Table 8: Components of the Topology for Configuring MSTP on EX Series Switches (*continued*)

Property	Settings
Switch 3	<p>The following interfaces on Switch 3 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <b>ge-0/0/26</b> is connected to Switch 1</li> <li>• <b>ge-0/0/28</b> is connected to Switch 2</li> <li>• <b>ge-0/0/24</b> is connected to Switch 4</li> </ul>
Switch 4	<p>The following interfaces on Switch 4 are connected in this way:</p> <ul style="list-style-type: none"> <li>• <b>ge-0/0/19</b> is connected to Switch 1</li> <li>• <b>ge-0/0/23</b> is connected to Switch 3</li> </ul>
VLAN names and tag IDs	<b>voice-vlan</b> , tag 10 <b>employee-vlan</b> , tag 20 <b>guest-vlan</b> , tag 30 <b>camera-vlan</b> , tag 40
MSTIs	1 2
MSTI region	<b>region1</b>

The topology in [Figure 2 on page 42](#) shows a common and internal spanning tree (CIST). The CIST is a single spanning tree connecting all devices in the network. The switch with the lowest bridge priority is elected as the root bridge of the CIST. You can control the election of the root bridge by configuring the bridge priority. Switch 3 is the root bridge of the CIST.

The ports in an MSTP topology have specific roles:

- The *root port* is responsible for forwarding data to the root bridge.
- The *alternate port* is a standby port for the root port. When a root port goes down, the alternate port becomes the active root port.
- The *designated port* forwards data to the downstream network segment or device.
- The *backup port* becomes the active designated port and starts forwarding data when the designated port goes down.

In this example, one MSTP region contains Switch 1, Switch 2, Switch 3, and Switch 4. Within the region, four VLANs are created:

- **voice-vlan** supports voice traffic and has the VLAN tag identifier of **10**.
- **employee-vlan** supports data traffic and has the VLAN tag identifier of **20**.
- **guest-vlan** supports guest VLAN traffic (for supplicants that fail authentication) and has the VLAN tag identifier of **30**.
- **camera-vlan** supports video traffic and has the VLAN tag identifier of **40**.

The VLANs are associated with specific interfaces on each of the four switches. Two MSTIs, 1 and 2, are then associated with the VLAN tag identifiers, and some MSTP parameters, such as cost, are configured on each switch.

## Configuring MSTP on Switch 1

**CLI Quick Configuration** To quickly configure interfaces and MSTP on Switch 1, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans voice-vlan description "Voice VLAN"
set vlans voice-vlan vlan-id 10
set vlans employee-vlan description "Employee VLAN"
set vlans employee-vlan vlan-id 20
set vlans guest-vlan description "Guest VLAN"
set vlans guest-vlan vlan-id 30
set vlans camera-vlan description "Camera VLAN"
set vlans camera-vlan vlan-id 40
set interfaces ge-0/0/13 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/9 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/13 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/9 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/11 unit 0 family ethernet-switching port-mode trunk
set protocols mstp configuration-name region1
set protocols mstp bridge-priority 16k
set protocols mstp interface ge-0/0/13.0 cost 1000
set protocols mstp interface ge-0/0/13.0 mode point-to-point
set protocols mstp interface ge-0/0/9.0 cost 1000
set protocols mstp interface ge-0/0/9.0 mode point-to-point
set protocols mstp interface ge-0/0/11.0 cost 1000
set protocols mstp interface ge-0/0/11.0 mode point-to-point
set protocols mstp msti 1 bridge-priority 16k
set protocols mstp msti 1 vlan [10 20]
set protocols mstp msti 1 interface ge-0/0/11.0 cost 1000
set protocols mstp msti 2 bridge-priority 8k
set protocols mstp msti 2 vlan [30 40]
```

**Step-by-Step Procedure** To configure interfaces and MSTP on Switch 1:

1. Configure the VLANs `voice-vlan`, `employee-vlan`, `guest-vlan`, and `camera-vlan`:

```
[edit vlans]
user@switch1# set voice-vlan description "Voice VLAN"
user@switch1# set voice-vlan vlan-id 10
user@switch1# set employee-vlan description "Employee VLAN"
user@switch1# set employee-vlan vlan-id 20
user@switch1# set guest-vlan description "Guest VLAN"
user@switch1# set guest-vlan vlan-id 30
user@switch1# set camera-vlan description "Camera VLAN"
user@switch1# set guest-vlan vlan-id 40
```

2. Configure the VLANs on the interfaces, including support for the Ethernet Switching protocol:

```
[edit interfaces]
user@switch1# set ge-0/0/13 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch1# set ge-0/0/9 unit 0 family ethernet-switching vlan members [10 20 30 40]
```

- ```

user@switch1# set ge-0/0/11 unit 0 family ethernet-switching vlan members [10 20 30 40]

```
3. Configure the port mode for the interfaces:
 

```

[edit interfaces]
user@switch1# set ge-0/0/13 unit 0 family ethernet-switching port-mode trunk
user@switch1# set ge-0/0/9 unit 0 family ethernet-switching port-mode trunk
user@switch1# set ge-0/0/11 unit 0 family ethernet-switching port-mode trunk

```
  4. Configure MSTP on the switch, including the two MSTIs:
 

```

[edit protocols]
user@switch1# mstp configuration-name region1
user@switch1# mstp bridge-priority 16k
user@switch1# mstp interface ge-0/0/13.0 cost 1000
user@switch1# mstp interface ge-0/0/13.0 mode point-to-point
user@switch1# mstp interface ge-0/0/9.0 cost 1000
user@switch1# mstp interface ge-0/0/9.0 mode point-to-point
user@switch1# mstp interface ge-0/0/11.0 cost 1000
user@switch1# mstp interface ge-0/0/11.0 mode point-to-point
user@switch1# mstp msti 1 bridge-priority 16k
user@switch1# mstp msti 1 vlan [10 20]
user@switch1# mstp msti 1 interface ge-0/0/11.0 cost 1000
user@switch1# mstp msti 2 bridge-priority 8k
user@switch1# mstp msti 2 vlan [30 40]

```

**Results** Check the results of the configuration:

```

user@switch1> show configuration
interfaces {
  ge-0/0/13 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
  ge-0/0/9 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
  ge-0/0/11 {
    unit 0 {
      family ethernet-switching {

```

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## Configuring MSTP on Switch 2

**CLI Quick Configuration** To quickly configure interfaces and MSTP on Switch 2, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans voice-vlan description "Voice VLAN"
set vlans voice-vlan vlan-id 10
set vlans employee-vlan description "Employee VLAN"
set vlans employee-vlan vlan-id 20
set vlans guest-vlan description "Guest VLAN"
set vlans guest-vlan vlan-id 30
set vlans camera-vlan description "Camera VLAN"
set vlans camera-vlan vlan-id 40
set interfaces ge-0/0/14 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/18 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/14 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/18 unit 0 family ethernet-switching port-mode trunk
set protocols mstp configuration-name region1
set protocols mstp bridge-priority 32k
set protocols mstp interface ge-0/0/14.0 cost 1000
set protocols mstp interface ge-0/0/14.0 mode point-to-point
set protocols mstp interface ge-0/0/18.0 cost 1000
set protocols mstp interface ge-0/0/18.0 mode point-to-point
set protocols mstp msti 1 bridge-priority 32k
set protocols mstp msti 1 vlan [10 20]
set protocols mstp msti 2 bridge-priority 4k
set protocols mstp msti 2 vlan [30 40]
```

**Step-by-Step Procedure** To configure interfaces and MSTP on Switch 2:

1. Configure the VLANs **voice-vlan**, **employee-vlan**, **guest-vlan**, and **camera-vlan**:

```
[edit vlans]
user@switch2# set voice-vlan description "Voice VLAN"
user@switch2# set voice-vlan vlan-id 10
user@switch2# set employee-vlan description "Employee VLAN"
user@switch2# set employee-vlan vlan-id 20
user@switch2# set guest-vlan description "Guest VLAN"
user@switch2# set guest-vlan vlan-id 30
user@switch2# set camera-vlan vlan-description "Camera VLAN"
user@switch2# set guest-vlan vlan-id 40
```

2. Configure the VLANs on the interfaces, including support for the Ethernet Switching protocol:

```
[edit interfaces]
user@switch2# set ge-0/0/14 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch2# set ge-0/0/18 unit 0 family ethernet-switching vlan members [10 20 30 40]
```

3. Configure the port mode for the interfaces:

```
[edit interfaces]
user@switch2# set ge-0/0/14 unit 0 family ethernet-switching port-mode trunk
user@switch2# set ge-0/0/18 unit 0 family ethernet-switching port-mode trunk
```

4. Configure MSTP on the switch, including the two MSTIs:

```
[edit protocols]
user@switch2# mstp configuration-name region1
user@switch2# mstp bridge-priority 32k
```

```
user@switch2# mstp interface ge-0/0/14.0 cost 1000
user@switch2# mstp interface ge-0/0/14.0 mode point-to-point
user@switch2# mstp interface ge-0/0/18.0 cost 1000
user@switch2# mstp interface ge-0/0/18.0 mode point-to-point
user@switch2# mstp msti 1 bridge-priority 32k
user@switch2# mstp msti 1 vlan [10 20]
user@switch2# mstp msti 2 bridge-priority 4k
user@switch2# mstp msti 2 vlan [30 40]
```

**Results** Check the results of the configuration:

```
user@switch2> show configuration
interfaces {
  ge-0/0/14 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
  ge-0/0/18 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
}
protocols {
  mstp {
    configuration-name region1;
    bridge-priority 32k;
    interface ge-0/0/14.0 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/18.0 {
      cost 1000;
      mode point-to-point;
    }
    msti 1 {
      bridge-priority 32k;
      vlan [10 20];
    }
  }
}
```



```

        msti 2 {
            bridge-priority 4k;
            vlan [30 40];
        }
    }
}
vlangs {
    voice-vlan {
        vlan-id 10;
    }
    employee-vlan {
        vlan-id 20;
    }
    guest-vlan {
        vlan-id 30;
    }
    camera-vlan {
        vlan-id 40;
    }
}
}

```

### Configuring MSTP on Switch 3

**CLI Quick Configuration** To quickly configure interfaces and MSTP on Switch 3, copy the following commands and paste them into the switch terminal window:

```

[edit]
set vlans voice-vlan description "Voice VLAN"
set vlans voice-vlan vlan-id 10
set vlans employee-vlan description "Employee VLAN"
set vlans employee-vlan vlan-id 20
set vlans guest-vlan description "Guest VLAN"
set vlans guest-vlan vlan-id 30
set vlans camera-vlan description "Camera VLAN"
set vlans camera-vlan vlan-id 40
set interfaces ge-0/0/26 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/28 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/24 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/26 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/28 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/24 unit 0 family ethernet-switching port-mode trunk
set protocols mstp configuration-name region1
set protocols mstp bridge-priority 8k
set protocols mstp interface ge-0/0/26.0 cost 1000
set protocols mstp interface ge-0/0/26.0 mode point-to-point
set protocols mstp interface ge-0/0/28.0 cost 1000
set protocols mstp interface ge-0/0/28.0 mode point-to-point
set protocols mstp interface ge-0/0/24.0 cost 1000
set protocols mstp interface ge-0/0/24.0 mode point-to-point
set protocols mstp msti 1 bridge-priority 4k
set protocols mstp msti 1 vlan [10 20]
set protocols mstp msti 2 bridge-priority 16k
set protocols mstp msti 2 vlan [30 40]

```

**Step-by-Step Procedure** To configure interfaces and MSTP on Switch 3:

1. Configure the VLANs voice-vlan, employee-vlan, guest-vlan, and camera-vlan:

```
[edit vlans]
user@switch3# set voice-vlan description "Voice VLAN"
user@switch3# set voice-vlan vlan-id 10
user@switch3# set employee-vlan description "Employee VLAN"
user@switch3# set employee-vlan vlan-id 20
user@switch3# set guest-vlan description "Guest VLAN"
user@switch3# set guest-vlan vlan-id 30
user@switch3# set camera-vlan description "Camera VLAN"
user@switch3# set guest-vlan vlan-id 40
```

2. Configure the VLANs on the interfaces, including support for the Ethernet Switching protocol:

```
[edit interfaces]
user@switch3# set ge-0/0/26 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch3# set ge-0/0/28 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch3# set ge-0/0/24 unit 0 family ethernet-switching vlan members [10 20 30 40]
```

3. Configure the port mode for the interfaces:

```
[edit interfaces]
user@switch3# set ge-0/0/26 unit 0 family ethernet-switching port-mode trunk
user@switch3# set ge-0/0/28 unit 0 family ethernet-switching port-mode trunk
user@switch3# set ge-0/0/24 unit 0 family ethernet-switching port-mode trunk
```

4. Configure MSTP on the switch, including the two MSTIs:

```
[edit protocols]
user@switch3# mstp configuration-name region1
user@switch3# mstp bridge-priority 8k
user@switch3# mstp interface ge-0/0/26.0 cost 1000
user@switch3# mstp interface ge-0/0/26.0 mode point-to-point
user@switch3# mstp interface ge-0/0/28.0 cost 1000
user@switch3# mstp interface ge-0/0/28.0 mode point-to-point
user@switch3# mstp interface ge-0/0/24.0 cost 1000
user@switch3# mstp interface ge-0/0/24.0 mode point-to-point
user@switch3# mstp msti 1 bridge-priority 4k
user@switch3# mstp msti 1 vlan [10 20]
user@switch3# mstp msti 2 bridge-priority 16k
user@switch3# mstp msti 2 vlan [30 40]
```

**Results** Check the results of the configuration:

```
user@switch3> show configuration
interfaces {
  ge-0/0/26 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
}
```



```
}
vlands {
  voice-vlan {
    vlan-id 10;
  }
  employee-vlan {
    vlan-id 20;
  }
  guest-vlan {
    vlan-id 30;
  }
  camera-vlan {
    vlan-id 40;
  }
}
```

## Configuring MSTP on Switch 4

**CLI Quick Configuration** To quickly configure interfaces and MSTP on Switch 4, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans voice-vlan description "Voice VLAN"
set vlans voice-vlan vlan-id 10
set vlans employee-vlan description "Employee VLAN"
set vlans employee-vlan vlan-id 20
set vlans guest-vlan description "Guest VLAN"
set vlans guest-vlan vlan-id 30
set vlans camera-vlan description "Camera VLAN"
set vlans camera-vlan vlan-id 40
set interfaces ge-0/0/23 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/19 unit 0 family ethernet-switching vlan members [10 20 30 40]
set interfaces ge-0/0/23 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/19 unit 0 family ethernet-switching port-mode trunk
set protocols mstp configuration-name region1
set protocols mstp bridge-priority 16k
set protocols mstp interface ge-0/0/23.0 cost 1000
set protocols mstp interface ge-0/0/23.0 mode point-to-point
set protocols mstp interface ge-0/0/19.0 cost 1000
set protocols mstp interface ge-0/0/19.0 mode point-to-point
set protocols mstp msti 1 bridge-priority 16k
set protocols mstp msti 1 vlan [10 20]
set protocols mstp msti 2 bridge-priority 32k
set protocols mstp msti 2 vlan [30 40]
```

**Step-by-Step Procedure** To configure interfaces and MSTP on Switch 4:

1. Configure the VLANs `voice-vlan`, `employee-vlan`, `guest-vlan`, and `camera-vlan`:

```
[edit vlans]
user@switch4# set voice-vlan description "Voice VLAN"
user@switch4# set voice-vlan vlan-id 10
user@switch4# set employee-vlan description "Employee VLAN"
user@switch4# set employee-vlan vlan-id 20
user@switch4# set guest-vlan description "Guest VLAN"
user@switch4# set guest-vlan vlan-id 30
user@switch4# set camera-vlan description "Camera VLAN"
user@switch4# set camera-vlan vlan-id 40
```

2. Configure the VLANs on the interfaces, including support for the Ethernet Switching protocol:

```
[edit interfaces]
user@switch4# set ge-0/0/23 unit 0 family ethernet-switching vlan members [10 20 30 40]
user@switch4# set ge-0/0/19 unit 0 family ethernet-switching vlan members [10 20 30 40]
```

3. Configure the port mode for the interfaces:

```
[edit interfaces]
user@switch4# set ge-0/0/23 unit 0 family ethernet-switching port-mode trunk
user@switch4# set ge-0/0/19 unit 0 family ethernet-switching port-mode trunk
```

4. Configure MSTP on the switch, including the two MSTIs:

```
[edit protocols]
user@switch4# mstp configuration-name region1
user@switch4# mstp bridge-priority 16k
user@switch4# mstp interface ge-0/0/23.0 cost 1000
user@switch4# mstp interface ge-0/0/23.0 mode point-to-point
user@switch4# mstp interface ge-0/0/19.0 cost 1000
user@switch4# mstp interface ge-0/0/19.0 mode point-to-point
user@switch4# mstp msti 1 bridge-priority 16k
user@switch4# mstp msti 1 vlan [10 20]
user@switch4# mstp msti 2 bridge-priority 32k
user@switch4# mstp msti 2 vlan [30 40]
```

**Results** Check the results of the configuration:

```
user@switch4> show configuration
interfaces {
  ge-0/0/23 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
  ge-0/0/19 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members 10;
          members 20;
          members 30;
          members 40;
        }
      }
    }
  }
}
```

```
protocols {
  mstp {
    configuration-name region1;
    bridge-priority 16k;
    interface ge-0/0/23.0 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/19.0 {
      cost 1000;
      mode point-to-point;
    }
    msti 1 {
      bridge-priority 16k;
      vlan [10 20];
    }
    msti 2 {
      bridge-priority 32k;
      vlan [30 40];
    }
  }
}
vlands {
  voice-vlan {
    vlan-id 10;
  }
  employee-vlan {
    vlan-id 20;
  }
  guest-vlan {
    vlan-id 30;
  }
  camera-vlan {
    vlan-id 40;
  }
}
```

## Verification

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

- [Verifying MSTP Configuration on Switch 1 on page 54](#)
- [Verifying MSTP Configuration on Switch 2 on page 56](#)
- [Verifying MSTP Configuration on Switch 3 on page 57](#)
- [Verifying MSTP Configuration on Switch 4 on page 59](#)

---

### Verifying MSTP Configuration on Switch 1

**Purpose** Verify the MSTP configuration on Switch 1.

**Action** Issue the operational mode commands **show spanning-tree interface** and **show spanning-tree bridge**:

```
user@switch1> show spanning-tree interface
```

## Spanning tree interface parameters for instance 0

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/13.0 | 128:527 | 128:525               | 16384.0019e25040e0      | 1000         | BLK   | ALT  |
| ge-0/0/9.0  | 128:529 | 128:513               | 32768.0019e2503d20      | 1000         | BLK   | ALT  |
| ge-0/0/11.0 | 128:531 | 128:513               | 8192.0019e25051e0       | 1000         | FWD   | ROOT |

## Spanning tree interface parameters for instance 1

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/13.0 | 128:527 | 128:525               | 16384.0019e25040e0      | 1000         | BLK   | ALT  |
| ge-0/0/9.0  | 128:529 | 128:513               | 32768.0019e2503d20      | 1000         | BLK   | ALT  |
| ge-0/0/11.0 | 128:531 | 128:513               | 4096.0019e25051e0       | 1000         | FWD   | ROOT |

## Spanning tree interface parameters for instance 2

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/13.0 | 128:527 | 128:527               | 8192.0019e25044e0       | 1000         | FWD   | DESG |
| ge-0/0/9.0  | 128:529 | 128:513               | 4096.0019e2503d20       | 1000         | FWD   | ROOT |
| ge-0/0/11.0 | 128:531 | 128:531               | 8192.0019e25044e0       | 1000         | FWD   | DESG |

```
user@switch1> show spanning-tree bridge
```

## STP bridge parameters

```
Context ID                : 0
Enabled protocol          : MSTP
```

## STP bridge parameters for CIST

```
Root ID                   : 8192.00:19:e2:50:51:e0
Root cost                  : 1000
Root port                 : ge-0/0/13.0
CIST regional root        : 8192.00:19:e2:50:51:e0
CIST internal root cost   : 2000
Hello time                : 2 seconds
Maximum age               : 20 seconds
Forward delay             : 15 seconds
Hop count                 : 18
Message age               : 0
Number of topology changes : 3
Time since last topology change : 921 seconds
Local parameters
  Bridge ID               : 16384.00:19:e2:50:44:e0
  Extended system ID      : 0
  Internal instance ID    : 0
```

## STP bridge parameters for MSTI 1

```
MSTI regional root        : 4096.00:19:e2:50:51:e0
Root cost                  : 1000
Root port                 : ge-0/0/13.0
Hello time                : 2 seconds
Maximum age               : 20 seconds
Forward delay             : 15 seconds
Hop count                 : 18
Local parameters
  Bridge ID               : 16384.00:19:e2:50:44:e0
  Extended system ID      : 0
  Internal instance ID    : 1
```

## STP bridge parameters for MSTI 2

```

MSTI regional root      : 4096.00:19:e2:50:3d:20
Root cost                : 1000
Root port               : ge-0/0/9.0
Hello time              : 2 seconds
Maximum age             : 20 seconds
Forward delay           : 15 seconds
Hop count               : 19
Local parameters
  Bridge ID              : 8192.00:19:e2:50:44:e0
  Extended system ID     : 0
  Internal instance ID   : 2

```

**Meaning** The operational mode command **show spanning-tree interface** displays spanning-tree domain information such as the designated port and the port roles.

The operational mode command **show spanning-tree bridge** displays the spanning-tree domain information at either the bridge level or the interface level. If the optional interface name is omitted, all interfaces in the spanning-tree domain are displayed.

### Verifying MSTP Configuration on Switch 2

**Purpose** Verify the MSTP configuration on Switch 2.

**Action** Issue the operational mode commands **show spanning-tree interface** and **show spanning-tree bridge**:

```
user@switch2> show spanning-tree interface
```

Spanning tree interface parameters for instance 0

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/14.0 | 128:513 | 128:513               | 32768.0019e2503d20      | 1000         | FWD   | DESC |
| ge-0/0/18.0 | 128:519 | 128:515               | 8192.0019e25051e0       | 1000         | FWD   | ROOT |

Spanning tree interface parameters for instance 1

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/14.0 | 128:513 | 128:513               | 32769.0019e2503d20      | 1000         | FWD   | DESC |
| ge-0/0/18.0 | 128:519 | 128:515               | 4097.0019e25051e0       | 1000         | FWD   | ROOT |

Spanning tree interface parameters for instance 2

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/14.0 | 128:513 | 128:513               | 4098.0019e2503d20       | 1000         | FWD   | DESC |
| ge-0/0/18.0 | 128:519 | 128:519               | 4098.0019e2503d20       | 1000         | FWD   | DESC |

```
user@switch2> show spanning-tree bridge
```

```

STP bridge parameters
Context ID              : 0
Enabled protocol        : MSTP

```

STP bridge parameters for CIST



```

Root ID                               : 8192.00:19:e2:50:51:e0
Root cost                             : 1000
Root port                             : ge-0/0/18.0
CIST regional root                     : 8192.00:19:e2:50:51:e0
CIST internal root cost                : 1000
Hello time                            : 2 seconds
Maximum age                           : 20 seconds
Forward delay                         : 15 seconds
Hop count                             : 19
Message age                           : 0
Number of topology changes             : 1
Time since last topology change        : 782 seconds
Local parameters
  Bridge ID                           : 32768.00:19:e2:50:3d:20
  Extended system ID                   : 0
  Internal instance ID                 : 0

STP bridge parameters for MSTI 1
MSTI regional root                    : 4096.00:19:e2:50:51:e0
Root cost                             : 1000
Root port                             : ge-0/0/18.0
Hello time                            : 2 seconds
Maximum age                           : 20 seconds
Forward delay                         : 15 seconds
Hop count                             : 19
Local parameters
  Bridge ID                           : 32768.00:19:e2:50:3d:20
  Extended system ID                   : 0
  Internal instance ID                 : 1

STP bridge parameters for MSTI 2
MSTI regional root                    : 4096.00:19:e2:50:3d:20
Hello time                            : 2 seconds
Maximum age                           : 20 seconds
Forward delay                         : 15 seconds
Local parameters
  Bridge ID                           : 4096.00:19:e2:50:3d:20
  Extended system ID                   : 0
  Internal instance ID                 : 2

```

**Meaning** The operational mode command **show spanning-tree interface** displays spanning-tree domain information such as the designated port and the port roles. The spanning-tree interface parameters for instance 2 show that both ports are designated ports, which means Switch 2 is the root bridge for this instance.

The operational mode command **show spanning-tree bridge** displays the spanning-tree domain information at either the bridge level or interface level. If the optional interface name is omitted, all interfaces in the spanning-tree domain are displayed.

### Verifying MSTP Configuration on Switch 3

**Purpose** Verify the MSTP configuration on Switch 3.

**Action** Issue the operational mode commands **show spanning-tree interface** and **show spanning-tree bridge**:

```
user@switch3> show spanning-tree interface
```

## Spanning tree interface parameters for instance 0

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/26.0 | 128:513 | 128:513               | 8192.0019e25051e0       | 1000         | FWD   | DESC |
| ge-0/0/28.0 | 128:515 | 128:515               | 8192.0019e25051e0       | 1000         | FWD   | DESC |
| ge-0/0/24.0 | 128:517 | 128:517               | 8192.0019e25051e0       | 1000         | FWD   | DESC |

## Spanning tree interface parameters for instance 1

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/26.0 | 128:513 | 128:513               | 4096.0019e25051e0       | 1000         | FWD   | DESC |
| ge-0/0/28.0 | 128:515 | 128:515               | 4096.0019e25051e0       | 1000         | FWD   | DESC |
| ge-0/0/24.0 | 128:517 | 128:517               | 4096.0019e25051e0       | 1000         | FWD   | DESC |

## Spanning tree interface parameters for instance 2

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/26.0 | 128:513 | 128:531               | 8192.0019e25044e0       | 1000         | BLK   | ALT  |
| ge-0/0/28.0 | 128:515 | 128:519               | 4096.0019e2503d20       | 1000         | FWD   | ROOT |
| ge-0/0/24.0 | 128:517 | 128:517               | 16384.0019e25051e0      | 1000         | FWD   | DESC |

```
user@switch3> show spanning-tree bridge
```

## STP bridge parameters

```
Context ID : 0
Enabled protocol : MSTP
```

## STP bridge parameters for CIST

```
Root ID : 8192.00:19:e2:50:51:e0
CIST regional root : 8192.00:19:e2:50:51:e0
CIST internal root cost : 0
Hello time : 2 seconds
Maximum age : 20 seconds
Forward delay : 15 seconds
Number of topology changes : 3
Time since last topology change : 843 seconds
Local parameters
  Bridge ID : 8192.00:19:e2:50:51:e0
  Extended system ID : 0
  Internal instance ID : 0
```

## STP bridge parameters for MSTI 1

```
MSTI regional root : 4096.00:19:e2:50:51:e0
Hello time : 2 seconds
Maximum age : 20 seconds
Forward delay : 15 seconds
Local parameters
  Bridge ID : 4096.00:19:e2:50:51:e0
  Extended system ID : 0
  Internal instance ID : 1
```

## STP bridge parameters for MSTI 2

```
MSTI regional root : 4096.00:19:e2:50:3d:20
Root cost : 1000
Root port : ge-0/0/28.0
Hello time : 2 seconds
Maximum age : 20 seconds
```

```

Forward delay           : 15 seconds
Hop count               : 19
Local parameters
  Bridge ID             : 16384.00:19:e2:50:51:e0
  Extended system ID    : 0
  Internal instance ID  : 2

```

**Meaning** The operational mode command **show spanning-tree interface** displays spanning-tree domain information such as the designated port and the port roles. Switch 3 is the root bridge for instance 0, which is the CIST, as well as for instance 1. In both instances, all ports on Switch 3 are designated ports.

The operational mode command **show spanning-tree bridge** displays the spanning-tree domain information at either the bridge level or the interface level. If the optional interface name is omitted, all interfaces in the spanning-tree domain are displayed.

### Verifying MSTP Configuration on Switch 4

**Purpose** Verify the MSTP configuration on Switch 4.

**Action** Issue the operational mode commands **show spanning-tree interface** and **show spanning-tree bridge**:

```
user@switch4> show spanning-tree interface
```

```
Spanning tree interface parameters for instance 0
```

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/23.0 | 128:523 | 128:517               | 8192.0019e25051e0       | 1000         | FWD   | ROOT |
| ge-0/0/19.0 | 128:525 | 128:525               | 16384.0019e25040e0      | 1000         | FWD   | DESG |

```
Spanning tree interface parameters for instance 1
```

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/23.0 | 128:523 | 128:517               | 4096.0019e25051e0       | 1000         | FWD   | ROOT |
| ge-0/0/19.0 | 128:525 | 128:525               | 16384.0019e25040e0      | 1000         | FWD   | DESG |

```
Spanning tree interface parameters for instance 2
```

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/23.0 | 128:523 | 128:517               | 16384.0019e25051e0      | 1000         | BLK   | ALT  |
| ge-0/0/19.0 | 128:525 | 128:527               | 8192.0019e25044e0       | 1000         | FWD   | ROOT |

```
user@switch4> show spanning-tree bridge
```

```
STP bridge parameters
```

```
Context ID           : 0
Enabled protocol     : MSTP
```

```
STP bridge parameters for CIST
```

```
Root ID              : 8192.00:19:e2:50:51:e0
Root cost             : 0
Root port            : ge-0/0/23.0
CIST regional root   : 8192.00:19:e2:50:51:e0
```

```

CIST internal root cost      : 1000
Hello time                  : 2 seconds
Maximum age                 : 20 seconds
Forward delay               : 15 seconds
Hop count                   : 19
Message age                 : 0
Number of topology changes  : 4
Time since last topology change : 887 seconds
Local parameters
  Bridge ID                 : 16384.00:19:e2:50:40:e0
  Extended system ID        : 0
  Internal instance ID      : 0

STP bridge parameters for MSTI 1
MSTI regional root         : 4096.00:19:e2:50:51:e0
Root cost                   : 1000
Root port                   : ge-0/0/23.0
Hello time                  : 2 seconds
Maximum age                 : 20 seconds
Forward delay               : 15 seconds
Hop count                   : 19
Local parameters
  Bridge ID                 : 16384.00:19:e2:50:40:e0
  Extended system ID        : 0
  Internal instance ID      : 1

STP bridge parameters for MSTI 2
MSTI regional root         : 4096.00:19:e2:50:3d:20
Root cost                   : 2000
Root port                   : ge-0/0/19.0
Hello time                  : 2 seconds
Maximum age                 : 20 seconds
Forward delay               : 15 seconds
Hop count                   : 18
Local parameters
  Bridge ID                 : 32768.00:19:e2:50:40:e0
  Extended system ID        : 0
  Internal instance ID      : 2

```

**Meaning** The operational mode command **show spanning-tree interface** displays spanning-tree domain information such as the designated port and the port roles.

The operational mode command **show spanning-tree bridge** displays the spanning-tree domain information at either the bridge level or the interface level. If the optional interface name is omitted, all interfaces in the spanning-tree domain are displayed.

- Related Documentation**
- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
  - [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)

## Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches

EX Series switches provide Layer 2 loop prevention through 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 switches within a spanning-tree topology receive BPDUs from other devices, network outages can occur because of STP miscalculations.

This example configures BPDU protection on an EX Series switch that uses RSTP. The upstream configuration is done on the edge interfaces, where outside BPDUs are often received from other devices:

- [Requirements on page 61](#)
- [Overview and Topology on page 61](#)
- [Configuration on page 62](#)
- [Verification on page 63](#)

## Requirements

This example uses the following hardware and software components:

- Two EX Series switches in an RSTP topology
- Junos OS Release 9.1 or later for EX Series switches

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

- RSTP enabled on the switches.



**NOTE:** By default, RSTP is enabled on all EX Series switches.

## Overview and Topology

The switches, 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 3 on page 62](#) shows the topology for this example. In this example, Switch 1 and Switch 2 are configured for RSTP and create a loop-free topology. The interfaces on Switch 2 are edge access ports—edge access ports 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 Switch 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 Switch 2.

Figure 3: BPDU Protection Topology

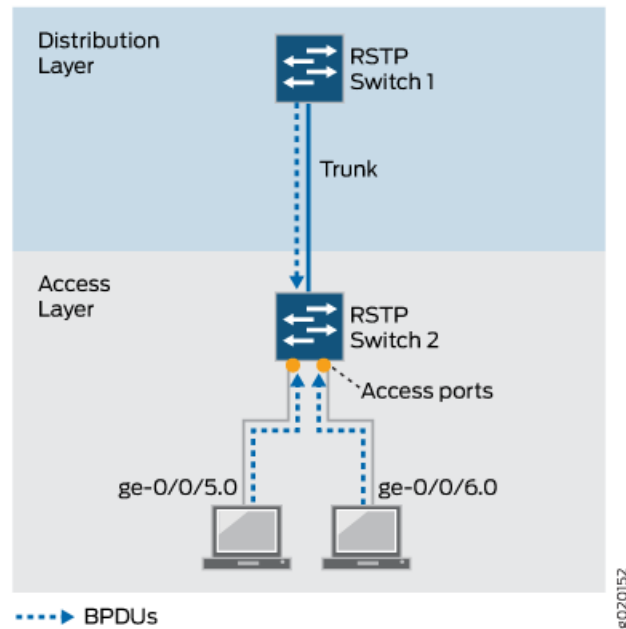


Table 9 on page 62 shows the components that will be configured for BPDU protection.

Table 9: Components of the Topology for Configuring BPDU Protection on EX Series Switches

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

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

## Configuration

To configure BPDU protection on two access interfaces:

### CLI Quick Configuration

Quickly configure RSTP on the two Switch 2 interfaces, and then configure BPDU protection on all edge ports on Switch 2 by copying the following commands and pasting them into the switch terminal window:

```
[edit]
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
```

**Step-by-Step Procedure** To configure RSTP on the two Switch 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@switch# set interface ge-0/0/5.0 edge
user@switch# set interface ge-0/0/6.0 edge
```

2. Configure BPDU protection on all edge ports on this switch:

```
[edit protocols rstp]
user@switch# set bpd-block-on-edge
```

**Results** Check the results of the configuration:

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

## Verification

To confirm that the configuration is working properly:

- [Displaying the Interface State Before BPDU Protection Is Triggered on page 63](#)
- [Verifying That BPDU Protection Is Working Correctly on page 64](#)

### 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:

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

Spanning tree interface parameters for instance 0

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>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 operational mode command **show spanning-tree interface** shows that **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 Switch 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:

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

```
Spanning tree interface parameters for instance 0
```

| Interface                  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>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<br>(Bpdu-Incon) | 128:518 | 128:518               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/6.0<br>(Bpdu-Incon) | 128:519 | 128:519               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| 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 Switch 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 (Spanning Trees)** 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 bpdud-error** to unblock and re-enable the interface.

If the PCs connected to Switch 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 is sending BPDUs to Switch 2.

- Related Documentation**
- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
  - [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
  - [Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71](#)



- [Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches on page 75](#)
- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16](#)

## Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches

Spanning-tree protocols support loop-free network communication through the exchange of a special type of frame called a bridge protocol data unit (BPDU). However, when BPDUs generated by spanning-tree protocols are communicated to devices on which spanning-tree protocols are not configured, these devices recognize the BPDUs, which can lead to network outages. You can, however, enable BPDU protection on switch interfaces to prevent BPDUs generated by spanning-tree protocols from passing through those interfaces. When BPDU protection is enabled, an interface shuts down or drops BPDU packets when any incompatible BPDU is encountered, thereby preventing the BPDUs generated by spanning-tree protocols from reaching the switch. When an interface is configured to drop BPDU packets, all traffic except the incompatible BPDUs can pass through the interface.



**NOTE:** The BPDU drop feature can be specified only on interfaces on which no spanning-tree protocol is configured.

This example configures BPDU protection on STP switch downstream interfaces that connect to two PCs:

- [Requirements on page 65](#)
- [Overview and Topology on page 66](#)
- [Configuration on page 67](#)
- [Verification on page 69](#)

### Requirements

This example uses the following hardware and software components:

- One EX Series switch in an RSTP topology
- One EX Series switch that is not in any spanning-tree topology
- Junos OS Release 9.1 or later for EX Series switches

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

- Ensured that RSTP is operating on Switch 1.
- Disabled or enabled RSTP on Switch 2 (depending on the configuration that you plan to implement.)

If you want to enable the BPDU shutdown feature, then it is optional to disable spanning-tree protocols on the interface.



**NOTE:** By default, RSTP is enabled on all EX Series switches.

## Overview and Topology

EX Series switches provide Layer 2 loop prevention through 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 BPDU to communicate. Other devices also use BPDUs—PC bridging applications, for example, 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 switches within a spanning-tree topology receive BPDUs from other devices, network outages can occur because of the miscalculations caused by the outside BPDUs. Therefore, you must configure BPDU protection on interfaces in a spanning-tree topology to avoid network outages.

This example explains how to block outside BPDUs from reaching a switch interface connected to devices that are not part of the STP topology. This example addresses two scenarios. In the first scenario, an interface is shutdown when it encounters an outside BPDU. In the second scenario, an interface drops only BPDU packets while retaining the status of the interface as up and allowing all other traffic to pass through the interface.

[Figure 3 on page 62](#) shows the topology for this example. Switch 1 and Switch 2 are connected through a trunk interface. Switch 1 is configured for RSTP while Switch 2 has a spanning-tree protocol configured on it for the first scenario, and does not have a spanning-tree protocol configured on it for the second scenario.

In the first scenario, this example configures downstream BPDU protection on Switch 2 interfaces **ge-0/0/5.0** and **ge-0/0/6.0** when the default spanning-tree protocol (RSTP) is not disabled on these interfaces. When BPDU protection is enabled with the **shutdown** statement, the switch interfaces will shut down if BPDUs generated by the laptops attempt to access Switch 2.

In the second scenario, this example configures downstream BPDU protection on Switch 2 interfaces **ge-0/0/5.0** and **ge-0/0/6.0** when the default spanning-tree protocol (RSTP) is disabled on these interfaces. When BPDU protection is enabled with the **drop** statement, the switch interfaces drop only the BPDUs while allowing remaining traffic to pass through and retaining their status as up if BPDUs generated by the laptops attempt to access Switch 2.



**CAUTION:** When configuring BPDU protection on an interface without spanning trees connected to a switch with spanning trees, be careful that you do not configure BPDU protection on all interfaces. Doing so could prevent

BPDUs being received on switch interfaces (such as a trunk interface) that you intended to have receive BPDUs from a switch with spanning trees.

Figure 4: BPDU Protection Topology

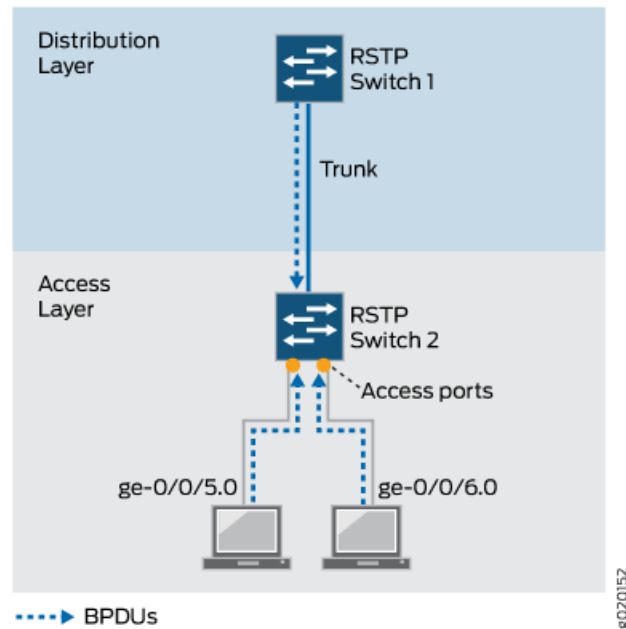


Table 10 on page 67 shows the components that will be configured for BPDU protection.

Table 10: Components of the Topology for Configuring BPDU Protection on EX Series Switches

| Property                      | Settings                                                                                                                                                          |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Switch 1 (Distribution Layer) | Switch 1 is connected to Switch 2 through a trunk interface. Switch 1 is configured for RSTP.                                                                     |
| Switch 2 (Access Layer)       | Switch 2 has two downstream access ports connected to laptops: <ul style="list-style-type: none"> <li>• <b>ge-0/0/5.0</b></li> <li>• <b>ge-0/0/6.0</b></li> </ul> |

## Configuration

To configure BPDU protection on the interfaces:

### CLI Quick Configuration

This is the first scenario that explains configuration for the **shutdown** statement. To quickly configure BPDU protection on Switch 2 for the **shutdown** statement, copy the following commands and paste them into the switch terminal window:

```
[edit]
user@switch# set ethernet-switching-options bpdu-block interface ge-0/0/5.0 shutdown
```

- Step-by-Step Procedure**
- To configure BPDU protection for the **shutdown** statement:
1. Configure the BPDU **shutdown** statement on the downstream interface **ge-0/0/5.0** on Switch 2:
 

```
[edit ethernet-switching-options]
user@switch# set bpd-block interface ge-0/0/5.0 shutdown
```
  2. Configure the BPDU **shutdown** statement on the downstream interface **ge-0/0/6.0** on Switch 2:
 

```
[edit ethernet-switching-options]
user@switch# set bpd-block interface ge-0/0/6.0 shutdown
```

**Results** Check the results of the configuration:

```
user@switch> show ethernet-switching-options
bpd-block {
  interface ge-0/0/5.0 {
    shutdown;
  }
  interface ge-0/0/6.0 {
    shutdown;
  }
}
```

**CLI Quick Configuration** This is the second scenario that explains configuration for the **drop** statement. To quickly configure BPDU protection on Switch 2 for the **drop** statement, copy the following commands and paste them into the switch terminal window:

```
[edit]
user@switch# set protocols rstp interface ge-0/0/5.0 disable
user@switch# set protocols rstp interface ge-0/0/6.0 disable
user@switch# set ethernet-switching-options bpd-block interface ge-0/0/5.0 drop
user@switch# set ethernet-switching-options bpd-block interface ge-0/0/6.0 drop
```



**NOTE:** You can also disable RSTP globally using the delete protocols rstp, the set protocols rstp disable, or the set protocols rstp interface all disable command.

- Step-by-Step Procedure** To configure BPDU protection for the **drop** statement:
1. Disable RSTP on both the interfaces **ge-0/0/5.0** and **ge-0/0/6.0** interfaces:
 

```
[edit]
user@switch# set protocols rstp interface ge-0/0/5.0 disable
user@switch# set protocols rstp interface ge-0/0/6.0 disable
```
  2. Configure the BPDU **drop** statement on the downstream interface **ge-0/0/5.0** on Switch 2:
 

```
[edit ethernet-switching-options]
user@switch# set bpd-block interface ge-0/0/5.0 drop
```

3. Configure the BPDU **drop** statement on the downstream interface **ge-0/0/6.0** on Switch 2:

```
[edit ethernet-switching-options]
user@switch# set bpd-block interface ge-0/0/6.0 drop
```

**Results** Check the results of the configuration:

```
user@switch> show protocols rstp
interface ge-0/0/5.0 {
  disable;
}
interface ge-0/0/6.0 {
  disable;
}
user@switch> show ethernet-switching-options
bpd-block {
  interface ge-0/0/5.0 {
    drop;
  }
  interface ge-0/0/6.0 {
    drop;
  }
}
```

## Verification

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

- [Displaying the Interface State Before BPDU Protection Is Triggered on page 69](#)
- [Verifying That BPDU Shutdown Protection Is Working Correctly on page 69](#)
- [Verifying That BPDU Drop Protection Is Working Correctly on page 70](#)

### Displaying the Interface State Before BPDU Protection Is Triggered

**Purpose** Before any BPDUs can be received on Switch 2 on either interface **ge-0/0/5.0** or interface **ge-0/0/6.0**, confirm the state of those interfaces.

**Action** Use the operational mode command **show ethernet-switching interfaces**:

```
user@switch> show ethernet-switching interfaces
```

| Interface  | State | VLAN members | Tag | Tagging  | Blocking  |
|------------|-------|--------------|-----|----------|-----------|
| ge-0/0/5.0 | up    | default      |     | untagged | unblocked |
| ge-0/0/6.0 | up    | default      |     | untagged | unblocked |

**Meaning** The output from the operational mode command **show ethernet-switching interfaces** shows that **ge-0/0/5.0** and interface **ge-0/0/6.0** are **up** and unblocked.

### Verifying That BPDU Shutdown Protection Is Working Correctly

**Purpose** Verify that BPDU protection is working correctly in the network by checking to see whether BPDUs have been blocked appropriately.

**Action** Issue `show ethernet-switching interfaces` to see what happened when the BPDUs reached the two interfaces configured for BPDU protection on Switch 2:

```
user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Tag  Tagging  Blocking
ge-0/0/5.0  down  default                untagged  Disabled by bpdu-control
ge-0/0/6.0  down  default                untagged  Disabled by bpdu-control
```

**Meaning** When the BPDUs sent from laptops reached interfaces `ge-0/0/5.0` and `ge-0/0/6.0` on Switch 2, the interfaces transitioned to a BPDU inconsistent state, shutting down the two interfaces to prevent BPDUs from reaching the laptops.

You need to re-enable the blocked interfaces. There are two ways to do this. If you included the statement `disable-timeout (Spanning Trees)` in the BPDU configuration, the interface returns to service after the timer expires. Otherwise, use the operational mode command `clear bpdu-error` to unblock and re-enable `ge-0/0/5.0` and `ge-0/0/6.0`. This command will only re-enable an interface but the BPDU configuration for the interface will continue to exist unless you remove the BPDU configuration explicitly.

If BPDUs reach the downstream interfaces on Switch 2 again, BPDU protection is triggered again and the interfaces shut down. In such cases, you must find and repair the misconfiguration that is sending BPDUs to interfaces `ge-0/0/5.0` and `ge-0/0/6.0`.

### Verifying That BPDU Drop Protection Is Working Correctly

**Purpose** Verify that BPDU drop protection is working correctly in the network by checking to see whether BPDUs have been blocked appropriately.

**Action** Issue `show ethernet-switching interfaces` to see what happened when the BPDUs reached the two interfaces configured for BPDU protection on Switch 2:

```
user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Tag  Tagging  Blocking
ge-0/0/5.0  up     default                untagged  unblocked-xSTP bpdu
                                     filter enabled
ge-0/0/6.0  up     default                untagged  unblocked-xSTP bpdu
                                     filter enabled
```

**Meaning** When the BPDUs sent from laptops reached interfaces `ge-0/0/5.0` and `ge-0/0/6.0` on Switch 2, the interfaces dropped those BPDUs to prevent them from reaching Switch 2, and the state of both the interfaces is `up`.

**Related Documentation**

- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71](#)

- [Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches on page 75](#)
- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16](#)

## Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches

EX Series switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP). Loop protection increases the efficiency of STP, RSTP, and MSTP by preventing interfaces from moving into a forwarding state that would result in a loop opening up in the network.

This example describes how to configure loop protection for an interface on an EX Series switch in an RSTP topology:

- [Requirements on page 71](#)
- [Overview and Topology on page 71](#)
- [Configuration on page 73](#)
- [Verification on page 73](#)

### Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.1 or later for EX Series switches
- Three EX Series switches in an RSTP topology

Before you configure the interface for loop protection, be sure you have:

- RSTP operating on the switches.



**NOTE:** By default, RSTP is enabled on all EX Series switches.

### Overview and Topology

A loop-free network in spanning-tree topologies is supported through the exchange of a special type of frame called bridge protocol data unit (BPDU). Peer STP applications running on the switch interfaces use BPDUs to communicate. Ultimately, the exchange of BPDUs determines which interfaces block traffic (preventing loops) and which interfaces become root ports and forward traffic.

A blocking interface can transition to the forwarding state in error if the interface stops receiving BPDUs from its designated port on the segment. Such a transition error can occur when there is a hardware error on the switch or software configuration error between the switch and its neighbor. When this happens, a loop opens up in the spanning tree.

Loops in a Layer 2 topology cause broadcast, unicast, and multicast frames to continuously circle the looped network. As a switch processes a flood of frames in a looped network, its resources become depleted and the ultimate result is a network outage.

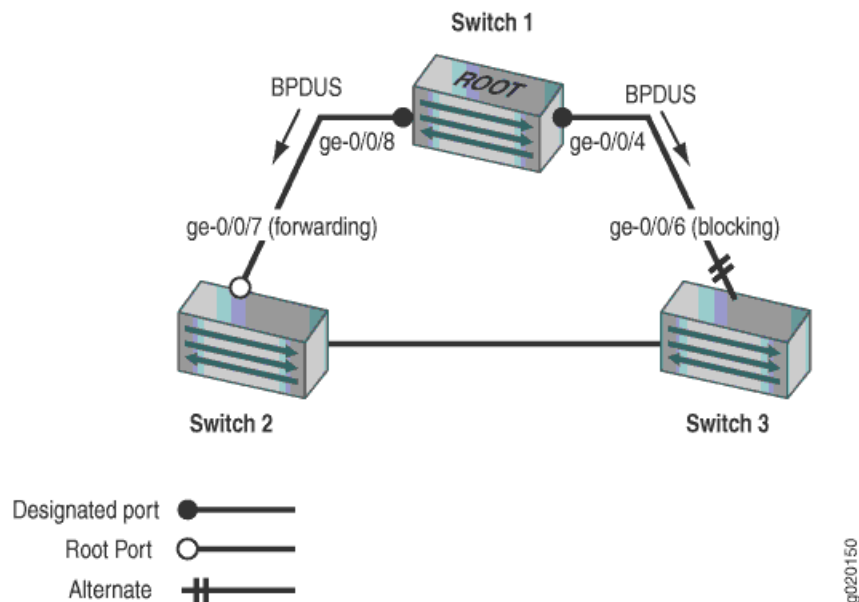


**CAUTION:** An interface can be configured for either loop protection or root protection, but not for both.

Three EX Series switches are displayed in [Figure 5 on page 72](#). In this example, they are configured for RSTP and create a loop-free topology. Interface **ge-0/0/6** is blocking traffic between Switch 3 and Switch 1; thus, traffic is forwarded through interface **ge-0/0/7** on Switch 2. BPDUs are being sent from the root bridge on Switch 1 to both of these interfaces.

This example shows how to configure loop protection on interface **ge-0/0/6** to prevent it from transitioning from a blocking state to a forwarding state and creating a loop in the spanning-tree topology.

**Figure 5: Network Topology for Loop Protection**



[Table 11 on page 72](#) shows the components that will be configured for loop protection.

**Table 11: Components of the Topology for Configuring Loop Protection on EX Series Switches**

| Property | Settings                                                              |
|----------|-----------------------------------------------------------------------|
| Switch 1 | Switch 1 is the root bridge.                                          |
| Switch 2 | Switch 2 has the root port <b>ge-0/0/7</b> .                          |
| Switch 3 | Switch 3 is connected to Switch 1 through interface <b>ge-0/0/6</b> . |



A spanning-tree topology contains ports that have specific roles:

- The *root port* is responsible for forwarding data to the root bridge.
- The *alternate port* is a standby port for the root port. When a root port goes down, the alternate port becomes the active root port.
- The *designated port* forwards data to the downstream network segment or device.

This configuration example uses an RSTP topology. However, you also can configure loop protection for STP or MSTP topologies at the `[edit protocols (mstp | stp)]` hierarchy level.

## Configuration

To configure loop protection on an interface:

### CLI Quick Configuration

To quickly configure loop protection on interface **ge-0/0/6**:

```
[edit]
set protocols rstp interface ge-0/0/6 bpdutimeout-action block
```

### Step-by-Step Procedure

To configure loop protection:

1. Configure interface **ge-0/0/6** on Switch 3:

```
[edit protocols rstp]
user@switch# set interface ge-0/0/6 bpdutimeout-action (Spanning Trees) block
```

### Results

Check the results of the configuration:

```
user@switch> show configuration protocols rstp
interface ge-0/0/6.0 {
  bpdutimeout-action {
    block;
  }
}
```

## Verification

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

- [Displaying the Interface State Before Loop Protection Is Triggered on page 73](#)
- [Verifying That Loop Protection Is Working on an Interface on page 74](#)

### Displaying the Interface State Before Loop Protection Is Triggered

#### Purpose

Before loop protection is triggered on interface **ge-0/0/6**, confirm that the interface is blocking.

**Action** Use the operational mode command:

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

Spanning tree interface parameters for instance 0

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>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 | 128:2                 | 16384.00aabbcc0348      | 20000        | BLK   | ALT  |

[output truncated]

**Meaning** The output from the operational mode command **show spanning-tree interface** shows that **ge-0/0/6.0** is the alternate port and in a blocking state.

### Verifying That Loop Protection Is Working on an Interface

**Purpose** Verify the loop protection configuration on interface **ge-0/0/6**. RSTP has been disabled on interface **ge-0/0/4** on Switch 1. This will stop BPDUs from being sent to interface **ge-0/0/6** and trigger loop protection on the interface.

**Action** Use the operational mode command:

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

Spanning tree interface parameters for instance 0

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>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        | BLK   | DIS  |

(Loop-Incon)

[output truncated]

**Meaning** The operational mode command **show spanning-tree interface** shows that interface **ge-0/0/6.0** has detected that BPDUs are no longer being forwarded to it and has moved into a loop-inconsistent state. The loop-inconsistent state prevents the interface from transitioning to a forwarding state. The interface recovers and transitions back to its original state as soon as it receives BPDUs.

**Related Documentation**

- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)

- [Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches on page 75](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
- [Understanding Loop Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 18](#)

## Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches

EX Series switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP). Root protection increases the efficiency of STP, RSTP, and MSTP by allowing network administrators to manually enforce the root bridge placement in the network.

This example describes how to configure root protection on an interface on an EX Series switch:

- [Requirements on page 75](#)
- [Overview and Topology on page 75](#)
- [Configuration on page 78](#)
- [Verification on page 78](#)

### Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.1 or later for EX Series switches
- Four EX Series switches in an RSTP topology

Before you configure the interface for root protection, be sure you have:

- RSTP operating on the switches.



**NOTE:** By default, RSTP is enabled on all EX Series switches.

### Overview and Topology

Peer STP applications running on switch interfaces exchange a special type of frame called a bridge protocol data unit (BPDU). Switches communicate interface information using BPDUs to create a loop-free topology that ultimately determines the root bridge and which interfaces block or forward traffic in the spanning tree.

However, a root port elected through this process has the possibility of being wrongly elected. A user bridge application running on a PC can generate BPDUs, too, and interfere with root port election.

To prevent this from happening, enable root protection on interfaces that should not receive superior BPDUs from the root bridge and should not be elected as the root port. These interfaces are typically located on an administrative boundary and are designated ports.

When root protection is enabled on an interface:

- The interface is blocked from becoming the root port.
- Root protection is enabled for all STP instances on that interface.
- The interface is blocked only for instances for which it receives superior BPDUs. Otherwise, it participates in the spanning-tree topology.



**CAUTION:** An interface can be configured for either root protection or loop protection, but not for both.

Four EX Series switches are displayed in [Figure 6 on page 77](#). In this example, they are configured for RSTP and create a loop-free topology. Interface **ge-0/0/7** on Switch 1 is a designated port on an administrative boundary. It connects to Switch 4. Switch 3 is the root bridge. Interface **ge-0/0/6** on Switch 1 is the root port.

This example shows how to configure root protection on interface **ge-0/0/7** to prevent it from transitioning to become the root port.

Figure 6: Network Topology for Root Protection

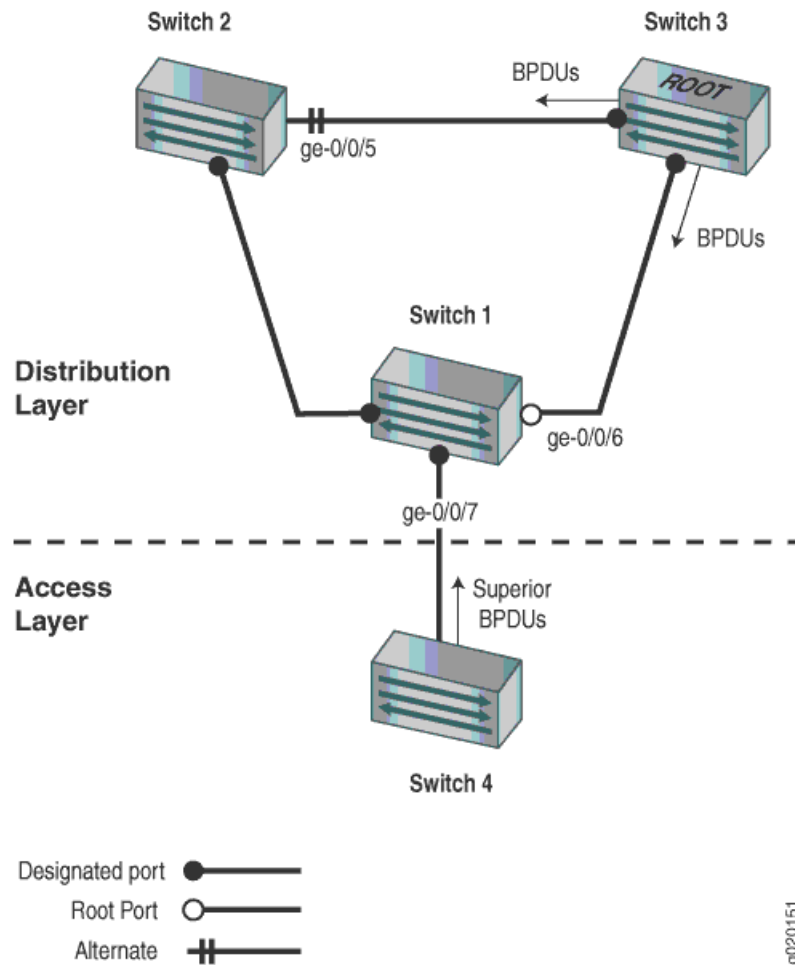


Table 12 on page 77 shows the components that will be configured for root protection.

Table 12: Components of the Topology for Configuring Root Protection on EX Series Switches

| Property | Settings                                                                                                                                                                                                 |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Switch 1 | Switch 1 is connected to Switch 4 through interface <b>ge-0/0/7</b> .                                                                                                                                    |
| Switch 2 | Switch 2 is connected to Switch 1 and Switch 3. Interface <b>ge-0/0/4</b> is the alternate port in the RSTP topology.                                                                                    |
| Switch 3 | Switch 3 is the root bridge and is connected to Switch 1 and Switch 2.                                                                                                                                   |
| Switch 4 | Switch 4 is connected to Switch 1. After root protection is configured on interface <b>ge-0/0/7</b> , Switch 4 will send superior BPDUs that will trigger root protection on interface <b>ge-0/0/7</b> . |

A spanning tree topology contains ports that have specific roles:

- The *root port* is responsible for forwarding data to the root bridge.

- The *alternate port* is a standby port for the root port. When a root port goes down, the alternate port becomes the active root port.
- The *designated port* forwards data to the downstream network segment or device.

This configuration example uses an RSTP topology. However, you also can configure root protection for STP or MSTP topologies at the `[edit protocols (mstp | stp)]` hierarchy level.

## Configuration

To configure root protection on an interface:

**CLI Quick Configuration** To quickly configure root protection on interface **ge-0/0/7**, copy the following command and paste it into the switch terminal window:

```
[edit]
set protocols rstp interface ge-0/0/7 no-root-port
```

**Step-by-Step Procedure** To configure root protection:

1. Configure interface **ge-0/0/7**:  

```
[edit protocols rstp]
user@switch#
set interface ge-0/0/7 no-root-port (Spanning Trees)
```

**Results** Check the results of the configuration:

```
user@switch> show configuration protocols rstp
interface ge-0/0/7.0 {
  no-root-port;
}
```

## Verification

To confirm that the configuration is working properly:

- [Displaying the Interface State Before Root Protection Is Triggered on page 78](#)
- [Verifying That Root Protection Is Working on the Interface on page 79](#)

### Displaying the Interface State Before Root Protection Is Triggered

**Purpose** Before root protection is triggered on interface **ge-0/0/7**, confirm the interface state.

**Action** Use the operational mode command:

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

Spanning tree interface parameters for instance 0

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>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 | 128:2                 | 16384.00aabbcc0348      | 20000        | BLK   | ALT  |
| ge-0/0/6.0 | 128:519 | 128:1                 | 16384.00aabbcc0348      | 20000        | FWD   | ROOT |
| ge-0/0/7.0 | 128:520 | 128:520               | 32768.0019e2503f00      | 20000        | FWD   | DESG |

[output truncated]

**Meaning** The output from the operational mode command **show spanning-tree interface** shows that **ge-0/0/7.0** is a designated port in a forwarding state.

### Verifying That Root Protection Is Working on the Interface

**Purpose** A configuration change takes place on Switch 4. A smaller bridge priority on the Switch 4 causes it to send superior BPDUs to interface **ge-0/0/7**. Receipt of superior BPDUs on interface **ge-0/0/7** will trigger root protection. Verify that root protection is operating on interface **ge-0/0/7**.

**Action** Use the operational mode command:

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

Spanning tree interface parameters for instance 0

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>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 | 128:2                 | 16384.00aabbcc0348      | 20000        | BLK   | ALT  |
| ge-0/0/6.0 | 128:519 | 128:1                 | 16384.00aabbcc0348      | 20000        | FWD   | ROOT |
| ge-0/0/7.0 | 128:520 | 128:520               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |

(Root-Incon)  
[output truncated]

**Meaning** The operational mode command **show spanning-tree interface** shows that interface **ge-0/0/7.0** has transitioned to a root inconsistent state. The root inconsistent state makes the interface block, discarding any received BPDUs, and prevents the interface from becoming a candidate for the root port. When the root bridge no longer receives superior STP BPDUs from the interface, the interface will recover and transition back to a forwarding state. Recovery is automatic.

**Related  
Documentation**

- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
- [Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
- [Understanding Root Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 19](#)



## CHAPTER 3

# Configuration Tasks

- [Configuring STP \(CLI Procedure\) on page 81](#)
- [Configuring Spanning Tree Protocols \(J-Web Procedure\) on page 82](#)
- [Configuring VSTP \(CLI Procedure\) on page 87](#)
- [Configuring BPDU Protection on an Interface \(CLI Procedure\) on page 88](#)
- [Unblocking an Interface That Receives BPDUs in Error \(CLI Procedure\) on page 94](#)

### Configuring STP (CLI Procedure)

---

The default spanning-tree protocol for EX Series switches is Rapid Spanning Tree Protocol (RSTP). RSTP provides faster convergence times than the original Spanning Tree Protocol (STP). However, some legacy networks require the slower convergence times of basic STP that work with 802.1D 1998 bridges.

If your network includes 802.1D 1998 bridges, you can remove RSTP and explicitly configure STP. When you explicitly configure STP, the switches use the IEEE 802.1D 2004 specification, force version 0. This configuration runs a version of RSTP that is compatible with the classic, basic STP.

To configure STP:

1. Either delete RSTP on the entire switch or disable RSTP on specific interfaces:

- To delete RSTP on the entire switch:

```
[edit protocols]  
user@switch# delete rstp
```

- To disable RSTP on a specific interface:

```
[edit protocols]  
user@switch# set rstp interface interface-name disable
```

2. Enable STP either on all interfaces or on a specific interface:

- To enable STP on all interfaces:

```
[edit protocols]  
user@switch# set stp interface all
```

- To enable STP on a specific interface:

```
[edit protocols]  
user@switch# set stp interface interface-name
```

3. (Optional) Only if a routed VLAN interface (RVI) is configured, enable the Address Resolution Protocol (ARP) for faster MAC address recovery:

- To enable ARP on STP on all interfaces:

```
[edit protocols]
user@switch# set stp interface all arp-on-stp
```

- To enable ARP on STP on a specific interface:

```
[edit protocols]
user@switch# set stp interface interface-name arp-on-stp
```

#### Related Documentation

- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [Understanding STP for EX Series Switches on page 12](#)

## Configuring Spanning Tree Protocols (J-Web Procedure)



**NOTE:** This topic applies only to the J-Web Application package.

For EX Series switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP), and VLAN Spanning Tree Protocol (VSTP). You can configure STP, RSTP, and MSTP by using the J-Web interface. You can configure bridge protocol data unit (BPDU) protection on interfaces to prevent them from receiving BPDUs that could result in STP misconfigurations, which could lead to network outages.



**NOTE:** In EX4300 switches, you can configure STP only by enabling RSTP and forcing it to act as STP. You need to select the Force STP check box from the RSTP configuration page.

To configure STP, MSTP, or RSTP for an EX Series switch by using the J-Web interface:

1. Select **Configure > Switching > Spanning Tree**.

The Spanning Tree Configuration page displays the spanning-tree protocol configuration parameters and a list of interfaces configured for each spanning-tree protocol configuration.



**NOTE:** After you make changes to the configuration on this page, you must commit the changes for them to take effect. To commit all changes to the active configuration, select **Commit Options > Commit**. See [Using the Commit Options to Commit Configuration Changes](#) for details about all commit options.

2. Click one of the following options:

- **Add**—Creates a spanning-tree protocol configuration.
  - a. Select a protocol name.
  - b. Enter information as described in [Table 13 on page 83](#).
  - c. Click **OK** to apply changes to the configuration or click **Cancel** to cancel without saving changes.
- **Edit**—Modifies a selected spanning-tree protocol configuration.
  - a. Enter information as described in [Table 13 on page 83](#).
  - b. Click **OK** to apply changes to the configuration or click **Cancel** to cancel without saving changes.
- **Delete**—Deletes a selected spanning-tree protocol configuration.

**Table 13: Spanning Tree Protocol Configuration Parameters**

| Field           | Function                                                                                                                                                                                                                                                          | Your Action                                  |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| General         |                                                                                                                                                                                                                                                                   |                                              |
| Protocol Name   | Specifies the spanning-tree protocol type: STP, MSTP, or RSTP.                                                                                                                                                                                                    | None.                                        |
| Disable         | Disables spanning-tree protocols on the interface.                                                                                                                                                                                                                | To enable this option, select the check box. |
| BPDU Protect    | Specifies BPDU protection on all edge interfaces on the switch.                                                                                                                                                                                                   | To enable this option, select the check box. |
| Bridge Priority | Specifies the bridge priority. The bridge priority determines 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. | Select a value from the list.                |
| Forward Delay   | Specifies the number of seconds an interface waits before changing from spanning-tree learning and listening states to the forwarding state.                                                                                                                      | Type a value.                                |
| Hello Time      | Specifies the time interval in seconds at which the root bridge transmits configuration BPDUs.                                                                                                                                                                    | Type a value.                                |
| Max Age         | Specifies the maximum-aging time in seconds for all MSTIs. The maximum aging time is the number of seconds a switch waits without receiving spanning-tree configuration messages before attempting a reconfiguration.                                             | Type a value.                                |
| Max Hops        | (MSTP only) Specifies the number of hops in a region before the BPDU is discarded.                                                                                                                                                                                | Type a value.                                |

Table 13: Spanning Tree Protocol Configuration Parameters (*continued*)

| Field                                                                 | Function                                                                                                                    | Your Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration Name                                                    | (MSTP only) Specifies the MSTP region name carried in the MSTP BPDUs.                                                       | Type a name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Revision Level                                                        | (MSTP only) Specifies the revision number of the MSTP configuration.                                                        | Type a value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Force STP Version                                                     | Enables or disables STP.                                                                                                    | To enable this option, select the check box.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p><b>NOTE:</b> This option is supported only on EX4300 switches.</p> |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Ports                                                                 |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Interface Name                                                        | Specifies an interface for the spanning-tree protocol.                                                                      | <ol style="list-style-type: none"> <li>1. Click the <b>Ports</b> tab.</li> <li>2. Choose one of the following options: <ul style="list-style-type: none"> <li>• Click <b>Add</b> and select an interface from the list. For an EX8200 Virtual Chassis configuration, select the member, FPC, and the interface from the list.</li> <li>• Select an interface in the <b>Port/State</b> table and click <b>Edit</b>.</li> <li>• To delete an interface from the configuration, select it in the <b>Port/State</b> table and click <b>Remove</b>.</li> </ul> </li> </ol> |
| Cost                                                                  | Specifies the link cost to determine which bridge is the designated bridge and which interface is the designated interface. | Type a value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Priority                                                              | Specifies the interface priority to determine which interface is elected as the root port.                                  | Select a value from the list.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Disable Port                                                          | Disables the spanning-tree protocol on the interface.                                                                       | To enable the option, select the check box.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>NOTE:</b> This option is not supported on EX4300 switches.</p>  |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Edge                                                                  | Configures the interface as an edge interface. Edge interfaces immediately transition to a forwarding state.                | To enable the option, select the check box.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Table 13: Spanning Tree Protocol Configuration Parameters (*continued*)

| Field                      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Your Action                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No Root Port               | Specifies an interface as a spanning-tree designated port. If the bridge receives superior STP BPDUs on a root-protected interface, that interface transitions to a root-prevented STP state (inconsistency state) and the interface is blocked. This blocking prevents a bridge that should not be the root bridge from being elected the root bridge. When the bridge stops receiving superior STP BPDUs on the root-protected interface, interface traffic is no longer blocked. | To enable the option, select the check box.                                                                                                                                                                                                                                                                                                                                                                                |
| Interface Mode             | Specifies the link mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>To enable the option, select the check box.</li> <li>Select one of the following: <ul style="list-style-type: none"> <li><b>Point to Point</b>—For a full-duplex link, the default link mode is point-to-point.</li> <li><b>Shared</b>—For a half-duplex link, the default link mode is shared.</li> </ul> </li> </ol>                                                              |
| BPDU Timeout Action        | Specifies the BPDU timeout action for the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>Select one of the following options:</p> <ul style="list-style-type: none"> <li><b>Log</b></li> <li><b>Block</b></li> </ul> <p><b>NOTE:</b> For EX4300 switches, you can select one of the following options:</p> <ul style="list-style-type: none"> <li><b>Alarm</b></li> <li><b>Block</b></li> </ul>                                                                                                                  |
| <b>MSTI</b><br>(MSTP only) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| MSTI Name                  | Specifies a name (an MSTI ID) for the MSTI.                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ol style="list-style-type: none"> <li>Click the <b>MSTI</b> tab.</li> <li>Choose one of the following options: <ul style="list-style-type: none"> <li>Click <b>Add</b>.</li> <li>Select an MSTI ID and click <b>Edit</b>.</li> <li>To delete an MSTI from the configuration, select the MSTI ID and click <b>Remove</b>.</li> </ul> </li> </ol> <p><b>NOTE:</b> For EX4300 switches, the MSTI ID can be 1 through 64.</p> |
| Bridge Priority            | Specifies the bridge priority. The bridge priority determines 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.                                                                                                                                                                                                                   | Select a value from the list.                                                                                                                                                                                                                                                                                                                                                                                              |

Table 13: Spanning Tree Protocol Configuration Parameters (*continued*)

| Field      | Function                             | Your Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN ID    | Specifies the VLAN for the MSTI.     | <p>In the VLAN box, choose one of the following options:</p> <ul style="list-style-type: none"> <li>Click <b>Add</b>, select a VLAN from the list, and click <b>OK</b>.</li> <li>To remove a VLAN association, select the VLAN ID, click <b>Remove</b>, and click <b>OK</b>.</li> </ul>                                                                                                                                                                                                                                                                                                                                                       |
| Interfaces | Specifies an interface for the MSTI. | <ol style="list-style-type: none"> <li>In the Interfaces box, click <b>Add</b> and select an interface from the list, or select an interface from the list and click <b>Edit</b>.</li> <li>Specify the link cost to determine which bridge is the designated bridge and which interface is the designated interface.</li> <li>Specify the interface priority to determine which interface is elected as the root port.</li> <li>If you want to disable the interface, select the check box.</li> <li>Click <b>OK</b>.</li> </ol> <p>To delete an interface configuration, select the interface, click <b>Remove</b>, and click <b>OK</b>.</p> |

- Related Documentation**
- [Monitoring Spanning Tree Protocols on page 145](#)
  - [Unblocking an Interface That Receives BPDUs in Error \(CLI Procedure\) on page 94](#)
  - [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
  - [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations](#)
  - [Example: Configuring Network Regions for VLANs with MSTP](#)
  - [Example: Configuring Faster Convergence and Improved Network Stability with RSTP](#)

## Configuring VSTP (CLI Procedure)

The default spanning-tree protocol for EX Series switches is Rapid Spanning Tree Protocol (RSTP). VLAN Spanning Tree Protocol (VSTP) is an alternate protocol that allows EX Series switches to run one or more Spanning Tree Protocol (STP) or RSTP instances for each VLAN on which VSTP is enabled. For networks with multiple VLANs, VSTP improves intelligent tree spanning by defining best paths within the VLANs instead of within the entire network.



**NOTE:** EX Series switches can have a maximum of 253 VLANs on VSTP. Therefore, to have as many spanning-tree protocol VLANs as possible, use both VSTP and RSTP. RSTP will then be applied to VLANs that exceed the limit for VSTP. Because RSTP is enabled by default, you just need to additionally enable VSTP.

You can configure VSTP for at the global level:

- For all interfaces on the switch
- For all interfaces within all VLANs
- For all interfaces within a specified VLAN
- For all interfaces within a specified VLAN group

You can configure or disable VSTP for a specific interface:

- For a specific interface on the switch
- For a specific interface within all VLANs
- For a specific interface within a specified VLAN
- For a specific interface within a specified VLAN group



**NOTE:**

- If you configure VSTP on an interface at both the global and the specific VLAN level, the interface configuration that is defined at the specific VLAN level overrides the interface configuration that is defined at the global level.
- If you specify VSTP to be configured on an interface that is not configured to belong to the VLAN (or VLANs), an error message is displayed.

To configure VSTP:

- For all interfaces on any of the following levels:
  - For all interfaces on the switch:

```
[edit protocols vstp]
user@switch# set interface all
```

- For all interfaces within all VLANs:

```
[edit protocols vstp]
user@switch# set vlan all interface all
```

- For all interfaces within a specified VLAN:

```
[edit protocols vstp]
user@switch# set vlan (vlan-id |vlan-range |open-set-of-values) interface all interface
all
```

- For all interfaces within a specified VLAN group:

```
[edit protocols vstp]
user@switch# set vlan-group vlan-group-name vlan (vlan-id |vlan-range |open-set-of-values)
interface all
```

- On a specific interface within any of the following scopes:

- For a specific interface on the switch:

```
[edit protocols vstp]
user@switch# set interface interface-name
```

- For a specific interface within all VLANs:

```
[edit protocols vstp]
user@switch# set vlan all interface interface-name
```



**CAUTION:** Ensure that the interface is a member of all VLANs before you add the interface to the VSTP configuration. If the interface is not a member of all VLANs, this VSTP configuration will fail when you try to commit it.

- For a specific interface within a specified VLAN:

```
[edit protocols vstp]
user@switch# set vlan vlan-id-or-vlan-range interface interface-name
```

- For a specific interface within a specified VLAN group:

```
[edit protocols vstp]
user@switch# set vlan-group vlan-group-name vlan (vlan-id |vlan-range |open-set-of-values)
interface interface-name
```

#### Related Documentation

- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)

## Configuring BPDU Protection on an Interface (CLI Procedure)

EX Series switches support spanning-tree protocols that prevent loops in a network by creating a tree topology (spanning-tree) of the entire bridged network. All spanning-tree protocols use a special type of frame called bridge protocol data units (BPDUs) to communicate with each other. Other devices in the network, such as PCs, generate their own BPDUs that are not compatible with the spanning-tree BPDUs. When BPDUs generated by other devices are transmitted to switches on which spanning-tree protocols



are configured, a misconfiguration can occur in the spanning tree and a network outage can occur. Therefore, it is necessary to protect an interface in a spanning-tree topology from BPDUs generated from other devices.

You can enable BPDU protection on interfaces that are configured as edge ports by using the **bpdu-block-on-edge** command. If you have not configured a port as an edge port, you can still configure BPDU protection on the interface by using the **bpdu-block** command under the **set ethernet-switching-options** hierarchy. You can also use the **bpdu-block** command to configure BPDU protection on interfaces configured for a spanning-tree.

This topic describes:

- [Configuring BPDU protection For Edge Interfaces on page 89](#)
- [Configuring BPDU Protection for Interfaces \(Port Shutdown Mode\) on page 90](#)
- [Configuring BPDU Protection for Interfaces \(BPDU Drop Mode\) on page 92](#)

## Configuring BPDU protection For Edge Interfaces

In a spanning-tree topology, if a switch is an access switch then interfaces on that switch will be connected to end devices such as PCs, servers, routers, or hubs, that are not connected to other switches. You configure these interfaces as edge interfaces because they directly connect to end devices. Interfaces that are configured as edge interfaces can transition to a forwarding state immediately because they cannot create network loops. A switch detects edge ports by noting the absence of communication from the end stations. As edge ports are connected to end devices, it is imperative that you configure BPDU protection on edge ports to protect the switch from outside BPDUs. If BPDU protection is enabled on an edge interface, the interface shuts down on encountering an outside BPDU thereby preventing any traffic from passing through the interface. You can re-enable the interface either by using the **disable-timeout** command while configuring BPDU protection, or by issuing the **clear ethernet-switching bpdu-error** operational mode command. The **clear ethernet-switching bpdu-error** command will only re-enable an interface but the BPDU configuration for the interface will continue to exist unless you explicitly remove the BPDU configuration.

To configure BPDU protection on an edge interface of a switch:



**NOTE:** Ensure that the switch is connected to an end device.

1. Configure any spanning-tree protocol on the switch if not configured already. RSTP is configured in this procedure.



**NOTE:** The Rapid Spanning Tree Protocol (RSTP) is configured by default on a switch.

```
[edit protocols]
user@switch# set rstp
```

2. Enable RSTP on a specific interface and set a priority for the interface—for example, **ge-0/0/0.0**:

```
[edit protocols]
```

```
user@switch# set rstp interface ge-0/0/0.0 priority 16
```

3. Configure the **ge-0/0/0.0** interface as an edge interface and enable BPDU protection on that interface:

```
[edit protocols]
```

```
user@switch# set rstp bpdu-block-on-edge interface ge-0/0/0.0 edge
```

4. Commit the configuration:

```
[edit]
```

```
user@switch# commit
```

5. Verify that BPDU protection is configured properly on the edge interface (**ge-0/0/0.0**):

- Run the **show ethernet-switching interfaces** operational mode command to ensure that BPDU protection is configured on the edge interface:

```
user@switch> show ethernet-switching interfaces
```

| Interface  | State | VLAN members | Tag | Tagging  | Blocking                 |
|------------|-------|--------------|-----|----------|--------------------------|
| ge-0/0/0.0 | down  | default      |     | untagged | Disabled by bpdu-control |
| me0.0      | up    | mgmt         |     | untagged | unblocked                |

In this output, you note that the **ge-0/0/0.0** interface is down because it has received BPDUs from the end device. Also, note that the state of the **Blocking** field is **Disabled by bpdu-control**, which indicates that the port is disabled because of BPDU protection.

- Run the **show spanning-tree interfaces** operational mode command to ensure that the **ge-0/0/0.0** interface is not displayed in the output.

## Configuring BPDU Protection for Interfaces (Port Shutdown Mode)

In a spanning-tree network, you might need to configure BPDU protection on interfaces that are not explicitly configured as edge interfaces. In such cases, use the **set ethernet-switching-options bpdu-block** configuration command for BPDU protection. When you use this command, you can configure for the interface to either shutdown, or to only drop the BPDU packets and retain its state as up, on receiving incompatible BPDU packets. For the procedure to configure an interface to drop BPDU packets and to retain its status as up, see [“Configuring BPDU Protection for Interfaces \(BPDU Drop Mode\)” on page 92](#). For configuring an interface to only drop incompatible BPDU packets and to retain the interface state as up, no spanning-tree protocol must be configured on the interface and also on the switch.

This section discusses the procedure to shutdown an interface when it receives incompatible BPDU packets. To configure an interface to shutdown upon receipt of incompatible BPDUs, a spanning-tree protocol may or may not be configured on the interface or switch.

To configure BPDU shutdown protection on interfaces:



**NOTE:** Ensure that the switch on which you are configuring BPDU protection is connected to a peer device.

1. Ensure that the interface on which you want to enable BPDU protection, is up and unblocked. For example, if you want to configure BPDU protection on the **ge-0/0/0.0** interface, following is the output of the **show ethernet-switching interfaces** command if the interface is up and unblocked:

```
user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Tag  Tagging  Blocking
ge-0/0/0.0  up    default      Tag  untagged unblocked
```

In this output, note that the state of the **ge-0/0/0.0** interface is **up** and the value for the **Blocking** field is **unblocked**.

2. (Optional) Configure any spanning-tree protocol on the switch if not configured already. The Rapid Spanning Tree Protocol (RSTP) is configured in this procedure.

```
[edit protocols]
user@switch# set rstp
```



**NOTE:** The Rapid Spanning Tree Protocol (RSTP) is configured by default on a switch.

3. Enable RSTP on a specific interface—for example, **ge-0/0/0.0**:

```
[edit protocols]
user@switch# set rstp interface ge-0/0/0.0
```

4. (Optional) Ensure that the spanning-tree protocol is configured on the **ge-0/0/0.0** interface:

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

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/0.0 | 128:513 | 16:513                | 8192.841888af0681       | 20000        | FWD   | ROOT |

In this output, the **ge-0/0/0.0** interface is displayed because a spanning-tree protocol is configured on this interface.

5. Enable the BPDU protection on the interface (**ge-0/0/0.0**) so that the interface shuts down on receiving incompatible BPDU packets:

```
[edit]
user@switch# set ethernet-switching-options bpdu-block interface ge-0/0/0.0 shutdown
```

6. Commit the configuration change:

```
[edit]
user@switch# commit
```

7. Verify that the BPDU protection is configured on the interface:

- Run the **show ethernet-switching interfaces** operational mode command to ensure that the BPDU protection is configured on the interface:

```
user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Tag  Tagging  Blocking
ge-0/0/0.0  down  default      Tag  untagged  Disabled by
bpdu-control
```

In this output, note that the state of the **ge-0/0/0.0** interface is down because it has received incompatible BPDUs from another device. Also, note that the value of the **Blocking** field is **Disabled by bpdu-control**, which indicates that the port is disabled because of BPDU protection.

- Run the **show spanning-tree interfaces** operational mode command to ensure that the **ge-0/0/0.0** interface is not displayed in the output.

## Configuring BPDU Protection for Interfaces (BPDU Drop Mode)

For certain access switches, you might want interfaces on the switch not to shutdown on encountering incompatible BPDU packets; instead, only drop incompatible BPDU packets while allowing the remaining traffic to pass through. Such an interface must not have a spanning-tree protocol configured on it, so that packets that pass through the interface will not cause STP misconfiguration and consequent network outages.

To configure BPDU protection for an interface to only drop incompatible BPDU packets and to allow the remaining traffic to pass through, while retaining the interface status as up:



**NOTE:** Ensure that the switch on which you are configuring BPDU protection is connected to a peer device.

1. Delete or disable any spanning-tree protocol (for instance, RSTP as in this procedure) configured on the switch or on any interface.

- To delete a spanning-tree protocol on the entire switch:

```
[edit]
user@switch# delete protocols rstp
```

Or,

```
[edit]
user@switch# set protocols rstp disable
```

- To delete a spanning-tree protocol on a specific interface (for example, **ge-0/0/0.0**) on the switch:

```
[edit]
user@switch# set protocols rstp interface ge-0/0/0.0 disable
```



**NOTE:** As RSTP is configured on a switch by default, ensure that you delete or disable RSTP even though you had not configured it explicitly.

2. Ensure that the interface on which you want to enable the BPDU protection, is up and unblocked. For example, if you want to configure the BPDU protection on the **ge-0/0/0.0** interface, following is the output of the **show ethernet-switching interfaces** command if the interface is up and unblocked:

```
user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Tag  Tagging  Blocking
ge-0/0/0.0  up    default      Tag  untagged unblocked
```

In this output, note that the state of the **ge-0/0/0.0** interface is **up** and the value for the **Blocking** field is **unblocked**.

3. Enable the BPDU protection on the interface (**ge-0/0/0.0** in this procedure) to drop BPDU packets:

```
[edit]
user@switch set ethernet-switching-options bpdu-block interface ge-0/0/0.0 drop
```

4. Commit the configuration:

```
[edit]
user@switch# commit
```

5. Verify that the BPDU protection is configured on the interface:

- Run the **show ethernet-switching interfaces** operational mode command to ensure that the BPDU protection is configured on the interface:

```
user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Tag  Tagging  Blocking
ge-0/0/0.0  up    default      untagged  unblocked-xSTP bpdu
                                     filter enabled
```

In this output, note that the **ge-0/0/0.0** interface is up even though it has received incompatible BPDU packets because the **drop** feature is configured for this interface. Also, note that the state of the **Blocking** field is **unblocked-xSTP bpdu filter enabled**, which indicates that the BPDU **drop** feature is enabled on this interface.

- Run the **show spanning-tree interfaces** operational mode command to ensure that the **ge-0/0/0.0** interface is displayed in the output and that the **State** of the interface is **DIS**, which indicates that the interface discards all incompatible BPDUs:

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

Interface  Port ID  Designated  Designated  Port  State  Role
          port ID  port ID    bridge ID   Cost
ge-0/0/0.0 128:513  16:513     8192.841888af0681 20000  DIS    DIS
```

#### Related Documentation

- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)

## Unblocking an Interface That Receives BPDUs in Error (CLI Procedure)

---

EX Series switches use bridge protocol data unit (BPDU) protection on interfaces to prevent them from receiving BPDUs that could trigger a spanning-tree misconfiguration. If BPDUs are received on a BPDU-protected interface, the interface either shuts down or transitions to a blocking state and stops forwarding frames. In the latter scenario, after the misconfiguration that triggered the BPDUs being sent to an interface is fixed in the topology, the interface can be unblocked and returned to service.

To unblock an interface and return it to service using the CLI:

- Automatically unblock an interface by configuring a timer that expires:

```
[edit ethernet-switching-options]  
user@switch# set bpdv-block disable-timeout 30
```

All interfaces on the switch will be re-enabled (unblocked) after the timer expires.

However, once an interface on the switch receives a new spanning-tree protocol BPDU, the interface returns to the blocked state.

- Manually unblock an interface using the operational mode command:

```
user@switch> clear bpdv-error interface ge-0/0/6.0
```

This command will only re-enable an interface but the BPDU configuration for the interface will continue to exist unless you remove the BPDU configuration explicitly.

### Related Documentation

- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65](#)
- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16](#)

## CHAPTER 4

# Configuration Statements

- [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 96](#)
- [\[edit protocols mstp\] Configuration Statement Hierarchy on EX Series Switches on page 97](#)
- [\[edit protocols rstp\] Configuration Statement Hierarchy on EX Series Switches on page 99](#)
- [\[edit protocols stp\] Configuration Statement Hierarchy on EX Series Switches on page 100](#)
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- [block \(Spanning Trees\) on page 103](#)
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- [forward-delay \(Spanning Trees\) on page 116](#)
- [hello-time \(Spanning Trees\) on page 117](#)
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- [log \(Spanning Trees\) on page 121](#)
- [max-age \(Spanning Trees\) on page 122](#)
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- [mode \(Spanning Trees\) on page 124](#)
- [msti \(Spanning Trees\) on page 125](#)
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- [no-root-port \(Spanning Trees\) on page 127](#)
- [priority \(Spanning Trees\) on page 128](#)
- [revision-level \(Spanning Trees\) on page 129](#)
- [rstp \(Spanning Trees\) on page 130](#)
- [shutdown \(BPDU Block\) on page 131](#)
- [stp \(Spanning Trees\) on page 132](#)
- [traceoptions \(Spanning Trees\) on page 134](#)
- [vlan \(Spanning Trees\) on page 137](#)
- [vlan \(VSTP\) on page 139](#)
- [vstp on page 141](#)

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## **[edit protocols] Configuration Statement Hierarchy on EX Series Switches**

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Each of the following topics lists the statements at a subhierarchy of the **[edit protocols]** hierarchy:

- [\[edit protocols bfd\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols bgp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols connections\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols dcbx\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols dot1x\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols igmp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols igmp-snooping\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols isis\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols lacp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols link-management\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols lldp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols lldp-med\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols mld\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols mld-snooping\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols mpls\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols msdp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols mstp\] Configuration Statement Hierarchy on EX Series Switches on page 97](#)



- [\[edit protocols mvrp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols neighbor-discovery\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols oam\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols ospf\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols ospf3\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols pim\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols rip\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols ripng\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols router-advertisement\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols router-discovery\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols rstp\] Configuration Statement Hierarchy on EX Series Switches on page 99](#)
- [\[edit protocols rsvp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols sflow\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols stp\] Configuration Statement Hierarchy on EX Series Switches on page 100](#)
- [\[edit protocols uplink-failure-detection\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols vrrp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols vstp\] Configuration Statement Hierarchy on EX Series Switches on page 101](#)

**Related  
Documentation**

- [EX Series Switch Software Features Overview](#)
- [EX Series Virtual Chassis Software Features Overview](#)

## [\[edit protocols mstp\] Configuration Statement Hierarchy on EX Series Switches](#)

This topic lists supported and unsupported configuration statements in the **[edit protocols mstp]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see *EX Series Switch Software Features Overview*.

This topic lists:

- [Supported Statements in the \[edit protocols mstp\] Hierarchy Level on page 98](#)
- [Unsupported Statements in the \[edit protocols mstp\] Hierarchy Level on page 99](#)

## Supported Statements in the [edit protocols mstp] Hierarchy Level

The following hierarchy shows the **[edit protocols mstp]** configuration statements supported on EX Series switches:

```
protocols {
  mstp {
    bpdu-block-on-edge;
    bpdu-destination-mac-address provider-bridge-group;
    bridge-priority priority;
    configuration-name configuration-name;
    disable;
    forward-delay seconds;
    hello-time seconds;
    interface interface-name {
      access-trunk;
      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 {
      bridge-priority priority;
      interface interface-name {
        cost cost;
        priority interface-priority;
      }
      vlan [ vlan-ids ];
    }
    priority-hold-time seconds;
    revision-level revision-level;
    traceoptions {
      file filename <files number> <size maximum-file-size> <world-readable |
        no-world-readable>;
      flag flag <disable>;
    }
  }
}
```

## Unsupported Statements in the [edit protocols mstp] Hierarchy Level

All statements in the **[edit protocols mstp]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

- Related Documentation**
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
  - [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 96](#)

## [edit protocols rstp] Configuration Statement Hierarchy on EX Series Switches

This topic lists supported and unsupported configuration statements in the **[edit protocols rstp]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see *EX Series Switch Software Features Overview*.

This topic lists:

- [Supported Statements in the \[edit protocols rstp\] Hierarchy Level on page 99](#)
- [Unsupported Statements in the \[edit protocols rstp\] Hierarchy Level on page 100](#)

## Supported Statements in the [edit protocols rstp] Hierarchy Level

The following hierarchy shows the **[edit protocols rstp]** configuration statements supported on EX Series switches:

```
protocols {
  rstp {
    bpdu-block-on-edge;
    bridge-priority priority;
    disable;
    forward-delay seconds;
    hello-time seconds;
    interface (all | interface-name) {
      arp-on-stp;
      bpdu-timeout-action {
        block;
        log;
      }
      cost cost;
      disable;
      edge;
      mode mode;
```

```
no-root-port;
priority priority;
}
max-age seconds;
traceoptions {
  file filename <files number > <size size > <no-stamp | no-world-readable |
  world-readable>;
  flag flag;
}
}
```

## Unsupported Statements in the [edit protocols rstp] Hierarchy Level

All statements in the **[edit protocols rstp]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

### Related Documentation

- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
- [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 96](#)

## [edit protocols stp] Configuration Statement Hierarchy on EX Series Switches

This topic lists supported and unsupported configuration statements in the **[edit protocols stp]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see *EX Series Switch Software Features Overview*.

This topic lists:

- [Supported Statements in the \[edit protocols stp\] Hierarchy Level on page 100](#)
- [Unsupported Statements in the \[edit protocols stp\] Hierarchy Level on page 101](#)

## Supported Statements in the [edit protocols stp] Hierarchy Level

The following hierarchy shows the **[edit protocols stp]** configuration statements supported on EX Series switches:

```
protocols {
```

```

stp {
  bpdv-block-on-edge;
  bridge-priority priority;
  disable;
  forward-delay seconds;
  hello-time seconds;
  interface (all | interface-name) {
    arp-on-stp;
    bpdv-timeout-action {
      block;
      log;
    }
    cost cost;
    disable;
    edge;
    mode mode;
    no-root-port;
    priority priority;
  }
  max-age seconds;
  traceoptions {
    file filename <files number > <size size > <no-stamp | world-readable |
      no-world-readable>;
    flag flag;
  }
}

```

## Unsupported Statements in the [edit protocols stp] Hierarchy Level

All statements in the [edit protocols stp] hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

### Related Documentation

- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Configuring STP \(CLI Procedure\) on page 81](#)
- [Understanding STP for EX Series Switches on page 12](#)
- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 96](#)

## [edit protocols vstp] Configuration Statement Hierarchy on EX Series Switches

This topic lists supported and unsupported configuration statements in the [edit protocols vstp] hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.

- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see *EX Series Switch Software Features Overview*.

This topic lists:

- [Supported Statements in the \[edit protocols vstp\] Hierarchy Level on page 102](#)
- [Unsupported Statements in the \[edit protocols vstp\] Hierarchy Level on page 102](#)

## Supported Statements in the [edit protocols vstp] Hierarchy Level

The following hierarchy shows the **[edit protocols vstp]** configuration statements supported on EX Series switches:

```
protocols {
  vstp {
    bpdu-block-on-edge;
    disable;
    force-version stp;
    vlan (all | vlan-id | vlan-name) {
      bridge-priority priority;
      forward-delay seconds;
      hello-time seconds;
      interface (all | interface-name) {
        bpdu-timeout-action {
          block;
          log;
        }
        cost cost;
        disable;
        edge;
        mode mode;
        no-root-port;
        priority priority;
      }
      max-age seconds;
      traceoptions {
        file filename <files number> <size size> <no-stamp | no-world-readable |
          world-readable>;
        flag flag;
      }
    }
  }
}
```

## Unsupported Statements in the [edit protocols vstp] Hierarchy Level

All statements in the **[edit protocols vstp]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

- |                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Related Documentation</b> | <ul style="list-style-type: none"> <li>• <a href="#">Configuring VLAN Spanning-Tree Protocol</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">[edit protocols] Configuration Statement Hierarchy on EX Series Switches on page 96</a></li> </ul> |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## block (Spanning Trees)

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | block;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ],<br>[edit protocols <a href="#">rstp interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ],<br>[edit protocols <a href="#">stp interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ],<br>[edit protocols <a href="#">vstp vlan <i>vlan-id</i> interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ]                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | Configure loop protection on a specific interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71</a></li> <li>• <a href="#">Understanding Loop Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 18</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul> |

## bpdu-block

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>bpdu-block {<br/>    <b>interface</b> (all   [<i>interface-name</i>]);<br/>    <b>disable-timeout</b> <i>seconds</i>;<br/>}</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | <p>Configure bridge protocol data unit (BPDU) protection on a specified interface or on all interfaces. If the interface receives incompatible BPDUs, it is disabled.</p> <p>If the <b>disable-timeout</b> statement is included in the BPDU configuration, the interface is automatically reenabled after the timer expires. Otherwise, you must use the operational mode command <b>clear bpdu-error</b> to unblock and reenable the interface.</p>                                                                                                                                                                                                |
| <b>Default</b>                  | Not enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | system—To view this statement in the configuration.<br>system-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">drop on page 113</a></li><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">clear bpdu-error on page 150</a></li><li>• <a href="#">Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65</a></li><li>• <a href="#">Unblocking an Interface That Receives BPDUs in Error (CLI Procedure) on page 94</a></li><li>• <a href="#">Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16</a></li></ul> |



## bpdu-block-on-edge

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | bpdu-block-on-edge;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ],<br>[edit protocols <a href="#">rstp</a> ],<br>[edit protocols <a href="#">vstp</a> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.<br>Statement updated in Junos OS Release 11.1 for EX Series switches to change blocking behavior to port shutdown.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | <p>Configure bridge protocol data unit (BPDU) protection on all edge ports of a switch. When the <b>bpdu-block-on-edge</b> statement is configured and the interface encounters an incompatible BPDU, the interface shuts down.</p> <p>If the <a href="#">disable-timeout</a> statement is included in the BPDU configuration, the interface is automatically reenabled after the timer expires. Otherwise, you must use the operational mode command <a href="#">clear bpdu-error</a> to unblock and reenable the interface.</p>                                                                                                                                                                                                                                |
| <b>Default</b>                  | Not enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">clear bpdu-error on page 150</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60</a></li> <li>• <a href="#">Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16</a></li> </ul> |

## bpdu-timeout-action (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>bpdu-timeout-action {<br/>    block;<br/>    log;<br/>}</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | <pre>[edit protocols <b>mstp interface</b> (all   <i>interface-name</i>)],<br/>[edit protocols <b>mstp interface</b> (all   <i>interface-name</i>) arp-on-stp],<br/>[edit protocols <b>rstp interface</b> (all   <i>interface-name</i>)],<br/>[edit protocols <b>rstp interface</b> (all   <i>interface-name</i>) arp-on-stp],<br/>[edit protocols <b>stp interface</b> (all   <i>interface-name</i>)],<br/>[edit protocols <b>stp interface</b> (all   <i>interface-name</i>) arp-on-stp],<br/>[edit protocols <b>vstp vlan <i>vlan-id</i> interface</b> (all   <i>interface-name</i>)],<br/>[edit protocols <b>vstp vlan <i>vlan-id</i> interface</b> (all   <i>interface-name</i>) arp-on-stp]</pre>                       |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | <p>Configure the BPDU timeout action on a specific interface. You must configure at least one action (<b>log</b>, <b>block</b>, or both).</p> <p>The remaining statements are explained separately.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li><li>• <a href="#">Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71</a></li><li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li></ul> |

## bridge-priority (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>bridge-priority <i>priority</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ],<br>[edit protocols <a href="#">mstp msti msti-id</a> ],<br>[edit protocols <a href="#">rstp</a> ],<br>[edit protocols <a href="#">stp</a> ],<br>[edit protocols <a href="#">vstp vlan vlan-id</a> ]                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | Configure the bridge priority. The bridge priority determines 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.                                                                                                                                                                                                                                        |
| <b>Default</b>                  | 32,768                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Options</b>                  | <p><i>priority</i>—Bridge priority. It can be set only in increments of 4096.</p> <p><b>Range:</b> 0 through 61,440</p> <p><b>Default:</b> 32,768</p>                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul> |

## configuration-name (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | configuration-name <i>configuration-name</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols mstp]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | Specify the configuration name. The configuration name is the MSTP region name carried in the MSTP BPDUs.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li><li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li></ul> |

## cost (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>cost cost;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp interface</a> (all   <i>interface-name</i> )],<br>[edit protocols <a href="#">mstp interface</a> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <a href="#">mstp msti msti-id interface interface-name</a> arp-on-stp],<br>[edit protocols <a href="#">mstp msti msti-id interface interface-name</a> ],<br>[edit protocols <a href="#">rstp interface</a> (all   <i>interface-name</i> )],<br>[edit protocols <a href="#">rstp interface</a> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <a href="#">stp interface</a> (all   <i>interface-name</i> )],<br>[edit protocols <a href="#">stp interface</a> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <a href="#">vstp vlan vlan-id interface</a> (all   <i>interface-name</i> )],<br>[edit protocols <a href="#">vstp vlan vlan-id interface</a> (all   <i>interface-name</i> ) arp-on-stp] |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), configure the link cost to control which bridge is the designated bridge and which interface is the designated interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>                  | The link cost is determined by the link speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Options</b>                  | <b>cost</b> —Link cost associated with the port.<br><b>Range:</b> 1 through 200,000,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Understanding RSTP for EX Series and QFX Series Switches on page 7</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                                    |

## disable (BPDU Block)

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|                                 |                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | disable;                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options <a href="#">bpdu-block interface</a> ]                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 12.2 for EX Series switches.                                                                                                                                                                                                                                   |
| <b>Description</b>              | Disable BPDU protection on all interfaces or on specific interfaces.                                                                                                                                                                                                                                    |
| <b>Default</b>                  | Not enabled                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | system—To view this statement in the configuration.<br>system-control—To add this statement to the configuration.                                                                                                                                                                                       |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">interface on page 118</a></li><li>• <a href="#">Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li></ul> |

## disable (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | disable;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | <pre>[edit protocols mpls], [edit protocols mpls interface (all   interface-name)], [edit protocols mstp], [edit protocols mstp interface (all   interface-name)], [edit protocols mstp interface (all   interface-name) arp-on-stp], [edit protocols mstp msti msti-id vlan (vlan-id   vlan-name) interface (all   interface-name)], [edit protocols mstp msti msti-id vlan (vlan-id   vlan-name) interface interface-name   arp-on-stp], [edit protocols rstp], [edit protocols rstp interface (all   interface-name)], [edit protocols rstp interface (all   interface-name) arp-on-stp], [edit protocols stp], [edit protocols stp interface (all   interface-name)], [edit protocols stp interface (all   interface-name) arp-on-stp], [edit protocols vstp], [edit protocols vstp vlan vlan-id interface (all   interface-name)] [edit protocols vstp vlan vlan-id interface (all   interface-name) arp-on-stp]</pre> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | Disable STP, MPLS, MSTP, RSTP, or VSTP on the switch or on a specific interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | <p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                                                                                                                                                                                                                                                                  |


## disable-timeout (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>disable-timeout <i>timeout</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options <a href="#">bpdu-block</a> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For interfaces configured for BPDU protection, specify the amount of time an interface receiving BPDUs is disabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>                  | The disable timeout is not enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | <b><i>timeout</i></b> —Amount of time, in seconds, the interface receiving BPDUs is disabled. Once the timeout expires, the interface is brought back into service.<br><b>Range:</b> 10 through 3600 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | system—To view this statement in the configuration.<br>system-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li><li>• <a href="#">Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65</a></li><li>• <a href="#">Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16</a></li></ul> |



## drop (BPDU Block)

|                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                                                                                                                                                                                                                                     | drop;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>                                                                                                                                                                                                                                                                            | [edit ethernet-switching-options <b>bpdu-block interface</b> (all   [ <i>interface-name</i> ])]                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>                                                                                                                                                                                                                                                                        | Statement introduced in Junos OS Release 12.2 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>                                                                                                                                                                                                                                                                                | Drop bridge protocol data units (BPDUs ) that enter any interface or a specified interface, but do not disable the interface. Configure the <b>drop</b> statement <i>only</i> on interfaces on which no spanning-tree protocol (STP, MSTP, or RSTP) is configured.                                                                                                                                                                                                                                                    |
| <div>  <p><b>NOTE:</b> Do not configure <b>drop</b> on any interface on which a spanning-tree protocol has been configured. Doing so could cause STP misconfiguration and consequent network outages.</p> </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Default</b>                                                                                                                                                                                                                                                                                    | Not enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b>                                                                                                                                                                                                                                                                   | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Documentation</b>                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• <a href="#">Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16</a></li> <li>• <a href="#">Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60</a></li> <li>• <a href="#">Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65</a></li> <li>• <a href="#">bpdu-block-on-edge on page 105</a></li> </ul> |

## edge (Spanning Trees)

|                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                                                                                                                                                                                                                                                                                                                                                            | edge;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>                                                                                                                                                                                                                                                                                                                                                                                                   | [edit protocols <b>mstp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>mstp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>mstp</b> <b>msti</b> <i>msti-id</i> <b>interface</b> <i>interface-name</i> ],<br>[edit protocols <b>mstp</b> <b>msti</b> <i>msti-id</i> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>rstp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>rstp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp] |
| <b>Release Information</b>                                                                                                                                                                                                                                                                                                                                                                                               | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                       | For Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), configure interfaces as edge interfaces. Edge interfaces immediately transition to a forwarding state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <div>  <b>NOTE:</b> Although the edge configuration statement appears in the [edit protocols stp interface (all   <i>interface-name</i>)] or [edit protocols rstp force-version stp interface (all   <i>interface-name</i>)] hierarchy on the switch, this statement has no effect on the switch operation if you configure it. </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>                                                                                                                                                                                                                                                                                                                                                                                                           | Edge interfaces are not enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b>                                                                                                                                                                                                                                                                                                                                                                                          | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related Documentation</b>                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                                                                                                                                                          |

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## force-version (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | force-version stp;                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">vstp</a> ]                                                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.4 for EX Series switches.                                                                                                                                                                                                              |
| <b>Description</b>              | Force VLAN Spanning Tree Protocol (VSTP) to use the STP protocol instead of the default protocol, RSTP.                                                                                                                                                                           |
| <b>Options</b>                  | <b>stp</b> —Spanning Tree Protocol                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                               |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li></ul> |

## forward-delay (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>forward-delay <i>seconds</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | <code>[edit protocols <i>mstp</i>],</code><br><code>[edit protocols <i>rstp</i>],</code><br><code>[edit protocols <i>stp</i>],</code><br><code>[edit protocols <i>vstp</i> <i>vlan</i> <i>vlan-id</i>]</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), specify how long a bridge interface remains in the listening and learning states before transitioning to the forwarding state.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>                  | 15 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Options</b>                  | <b><i>seconds</i></b> —Number of seconds the bridge interface remains in the listening and learning states.<br><b>Range:</b> 4 through 30 seconds<br><b>Default:</b> 15 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li><li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li><li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li><li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li></ul> |

## hello-time (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>hello-time <i>seconds</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ],<br>[edit protocols <a href="#">rstp</a> ],<br>[edit protocols <a href="#">stp</a> ],<br>[edit protocols <a href="#">vstp</a> <a href="#">vlan</a> <i>vlan-id</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), specify the time interval at which the root bridge transmits configuration BPDUs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Default</b>                  | 2 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Options</b>                  | <b><i>seconds</i></b> —Number of seconds between transmissions of configuration BPDUs.<br><b>Range:</b> 1 through 10 seconds<br><b>Default:</b> 2 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul> |

## interface (BPDU Block)

|                            |                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | interface (all   [ <i>interface-name</i> ]);                                                                |
| <b>Hierarchy Level</b>     | [edit ethernet-switching-options <b>bpdu-block</b> ]                                                        |
| <b>Release Information</b> | Statement introduced in Junos OS Release 9.1 for EX Series switches.                                        |
| <b>Description</b>         | Apply Bridge Protocol Data Unit (BPDU) protection on all interfaces or on one or more specified interfaces. |

Spanning Tree Protocol (STP), Rapid Spanning Tree protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP) provide Layer 2 loop prevention for EX Series switches. The spanning-tree protocols use BPDU frames to communicate. Through their exchange, spanning-tree topologies determine which interfaces block traffic and which interfaces become root ports and forward traffic. User bridge applications running on a PC can also generate BPDUs. If these BPDUs are picked up by STP applications running on the switch, they can trigger STP miscalculations that can lead to network outages.

To block outside BPDUs from reaching a switch interface connected to devices that are not part of a spanning-tree topology, configure BPDU protection on interfaces in the topology.



**CAUTION:** When configuring BPDU protection on an interface without spanning trees connected to a switch with spanning trees, be careful that you do not configure BPDU protection on all interfaces. Doing so could prevent BPDUs being received on switch interfaces (such as a trunk interface) that you intended to have receive BPDUs from a switch with spanning trees.



**NOTE:** Interfaces that are configured as edge interfaces can transition to a forwarding state immediately because they cannot create network loops. As edge ports are connected to end devices, it is imperative that you configure BPDU protection on edge ports to protect the switch from outside BPDUs. When BPDU protection is enabled on an edge interface, the interface shuts down on encountering an outside BPDU thereby preventing any traffic from passing through the interface. To enable BPDU protection on an edge interface, see [“Configuring BPDU Protection on an Interface \(CLI Procedure\)” on page 88](#)

**Options** all—All interfaces.

[*interface-name*]  
—One or more Ethernet interface names.

The remaining statements are explained separately.

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Required Privilege Level</b> | system—To view this statement in the configuration.<br>system-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li><li>• <a href="#">Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches on page 65</a></li></ul> |

## interface (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> interface <i>interface-name</i> {   arp-on-stp;   bpdu-timeout-action     block;     log;   cost <i>cost</i>;   disable;   edge;   mode <i>mode</i>;   no-root-port;   priority <i>priority</i>; } </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | <p>[edit protocols <a href="#">mstp</a>],<br/> [edit protocols <a href="#">mstp msti msti-id</a>],<br/> [edit protocols <a href="#">rstp</a>],<br/> [edit protocols <a href="#">stp</a>],<br/> [edit protocols <a href="#">vstp vlan</a> (all   <i>vlan-id</i>   <i>vlan-name</i>)]</p>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.<br/> Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.<br/> Statement introduced in Junos OS Release 11.1 for the QFX Series.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | <p>For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), configure an interface.</p> <p>The <b>edge</b>, <b>mode</b>, and <b>no-root-port</b> options are not available at the [edit protocols <a href="#">mstp msti msti-id</a>] hierarchy level.</p>                                                                                                                                                                                                                                                                                                                                                      |
| <b>Options</b>                  | <p><b><i>interface-name</i></b>—Name of an interface.</p> <p>The remaining statements are explained separately.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>routing—To view this statement in the configuration.<br/> routing-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP</a></li> <li>• <a href="#">Example: Configuring Faster Convergence and Improving Network Stability with RSTP</a></li> <li>• <a href="#">Configuring VSTP (CLI Procedure) on page 87</a></li> </ul> |



- [show spanning-tree bridge on page 158](#)

## log (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | log;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ],<br>[edit protocols <a href="#">rstp interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ],<br>[edit protocols <a href="#">stp interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ],<br>[edit protocols <a href="#">vstp vlan <i>vlan-id</i> interface</a> (all   <i>interface-name</i> ) <a href="#">bpdu-timeout-action</a> ]                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | For interfaces configured for loop protection, configure the software to generate a message to be sent to the system log file <code>/var/log/messages</code> to record the loop-protection event.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches on page 71</a></li> <li>• <a href="#">Understanding Loop Protection for STP, RSTP, VSTP, and MSTP on EX Series Switches on page 18</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul> |

## max-age (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>max-age seconds;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ],<br>[edit protocols <a href="#">rstp</a> ],<br>[edit protocols <a href="#">stp</a> ],<br>[edit protocols <a href="#">vstp</a> <a href="#">vlan</a> <i>vlan-id</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), specify the maximum expected arrival time of hello BPDUs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Default</b>                  | 20 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Options</b>                  | <b>seconds</b> —The maximum age of received protocol BPDUs.<br><b>Range:</b> 6 through 40 seconds<br><b>Default:</b> 20 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li><li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li><li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li><li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li></ul> |

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## max-hops (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>max-hops hops;</code>                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ]                                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | For Multiple Spanning Tree Protocol (MSTP), configure the maximum number of hops a BPDU can be forwarded in the MSTP region.                                                                                                                                                                                                                                                                |
| <b>Default</b>                  | 20 hops                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Options</b>                  | <b>hops</b> — Number of hops the BPDU can be forwarded.<br><b>Range:</b> 1 through 255 hops<br><b>Default:</b> 20 hops                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                         |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li></ul> |

## mode (Spanning Trees)

|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                                                                                                                                                                                                                   | <code>mode mode;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>                                                                                                                                                                                                                                                          | [edit protocols <b>mstp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>mstp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>mstp</b> <b>msti</b> <i>msti-id</i> <b>interface</b> <i>interface-name</i> ],<br>[edit protocols <b>mstp</b> <b>msti</b> <i>msti-id</i> <b>interface</b> <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>rstp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>rstp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>stp</b> <b>interface</b> (all   (all   <i>interface-name</i> ))],<br>[edit protocols <b>stp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp] |
| <b>Release Information</b>                                                                                                                                                                                                                                                      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>                                                                                                                                                                                                                                                              | For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), configure the link mode to identify point-to-point links.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>                                                                                                                                                                                                                                                                  | For a full-duplex link, the default link mode is <b>point-to-point</b> . For a half-duplex link, the default link mode is <b>shared</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <div style="display: flex; align-items: center;">  <div> <p><b>NOTE:</b> For EX4300 switches, the interfaces operate in full-duplex mode only.</p> </div> </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                                                                                                                                                                                                                                                                  | <b>mode</b> —Link mode: <ul style="list-style-type: none"> <li><b>point-to-point</b>—Link is point to point.</li> <li><b>shared</b>—Link is shared media.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b>                                                                                                                                                                                                                                                 | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Related Documentation</b>                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li><a href="#">show spanning-tree bridge on page 153</a></li> <li><a href="#">show spanning-tree interface on page 163</a></li> <li><a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li><a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li><a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li><a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  |

## msti (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> msti <i>msti-id</i> {   vlan (<i>vlan-id</i>   <i>vlan-name</i>);   interface <i>interface-name</i> {     disable;     cost <i>cost</i>;     priority <i>priority</i>;   } } </pre>                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ]                                                                                                                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | Configure the Multiple Spanning Tree Instance (MSTI) identifier for Multiple Spanning Tree Protocol (MSTP). MSTI IDs are local to each region, so you can reuse the same MSTI ID in different regions.                                                                                                                                                                                           |
| <b>Default</b>                  | MSTI is disabled.                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Options</b>                  | <p><b><i>msti-id</i></b> —MSTI identifier.</p> <p><b>Range:</b> 1 through 4094. The Common Instance Spanning Tree (CIST) is always MSTI 0.</p> <p>The remaining statements are explained separately.</p>                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                   |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> </ul> |

## mstp (Spanning Trees)

---

**Syntax**    mstp {  
              bpdu-block-on-edge;  
              bridge-priority *priority*;  
              configuration-name *name*;  
              disable;  
              forward-delay *seconds*;  
              hello-time *seconds*;  
              interface ( all | *interface-name* ){  
                  arp-on-stp;  
                  bpdu-timeout-action {  
                      block;  
                      log;  
                  }  
                  cost *cost*;  
                  disable;  
                  edge;  
                  mode *mode*;  
                  no-root-port;  
                  priority *priority*;  
              }  
              max-age *seconds*;  
              max-hops *hops*;  
              msti *msti-id* {  
                  vlan (*vlan-id* | *vlan-name*);  
                  interface *interface-name* {  
                      disable;  
                      cost *cost*;  
                      priority *priority*;  
                  }  
              }  
              revision-level *revision-level*;  
              traceoptions {  
                  file *filename* <files *number* > <size *size* > <no-stamp | world-readable |  
                      no-world-readable>;  
                  flag *flag*;  
              }  
          }

**Hierarchy Level**    [edit protocols]

**Release Information**    Statement introduced in Junos OS Release 9.0 for EX Series switches.

**Description**    Configure Multiple Spanning Tree Protocol (MSTP). MSTP is defined in the IEEE 802.1Q-2003 specification and is used to create a loop-free topology in networks with multiple spanning tree regions.

The statements are explained separately.

**Default**    MSTP is disabled.

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

**Related Documentation**

- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
- [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)

## no-root-port (Spanning Trees)

**Syntax** no-root-port;

**Hierarchy Level** [edit protocols [mstp interface](#) (all | *interface-name*)],  
[edit protocols [mstp interface](#) (all | *interface-name*) arp-on-stp],  
[edit protocols [rstp interface](#) (all | *interface-name*)],  
[edit protocols [rstp interface](#) (all | *interface-name*) arp-on-stp],  
[edit protocols [stp interface](#) (all | *interface-name*)],  
[edit protocols [stp interface](#) (all | *interface-name*) arp-on-stp],  
[edit protocols [vstp vlan vlan-id interface](#) (all | *interface-name*)],  
[edit protocols [vstp vlan vlan-id interface](#) (all | *interface-name*) arp-on-stp]

**Release Information** Statement introduced in Junos OS Release 9.1 for EX Series switches.  
Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.

**Description** Configure an interface to be a spanning-tree designated port. If the bridge receives superior STP bridge protocol data units (BPDUs) on a root-protected interface, that interface transitions to a root-prevented STP state (inconsistency state) and the interface is blocked. This blocking prevents a bridge from being elected the root bridge. When the bridge stops receiving superior STP BPDUs on the root-protected interface, interface traffic is no longer blocked.

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

**Related Documentation**

- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches on page 75](#)
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)

## priority (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>priority <i>priority</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit protocols <b>mstp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>mstp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>mstp</b> <b>msti</b> <i>msti-id</i> <b>interface</b> <i>interface-name</i> ],<br>[edit protocols <b>mstp</b> <b>msti</b> <i>msti-id</i> <b>interface</b> <i>interface-name</i> arp-on-stp],<br>[edit protocols <b>rstp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>rstp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>stp</b> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>stp</b> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp],<br>[edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i> <b>interface</b> (all   <i>interface-name</i> )],<br>[edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i> <b>interface</b> (all   <i>interface-name</i> ) arp-on-stp] |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.<br>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), VLAN Spanning Tree Protocol (VSTP), or Multiple Spanning Tree Protocol (MSTP), specify the interface priority to control which interface is elected as the root port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>                  | The default value is 128.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Options</b>                  | <b>priority</b> —Interface priority. The interface priority must be set in increments of 16.<br><b>Range:</b> 0 through 240                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                            |



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## revision-level (Spanning Trees)

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>revision-level <i>revision-level</i>;</code>                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit protocols <a href="#">mstp</a> ]                                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | For Multiple Spanning Tree Protocol (MSTP), set the revision number of the MSTP configuration.                                                                                                                                                                                                                                                                                              |
| <b>Default</b>                  | The revision level is disabled.                                                                                                                                                                                                                                                                                                                                                             |
| <b>Options</b>                  | <i>revision-level</i> —Revision number of the MSTP region configuration.<br><b>Range:</b> 0 through 65535                                                                                                                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                         |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li><li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li></ul> |

## rstp (Spanning Trees)

```
Syntax  rstp {
        bpd-block-on-edge;
        bridge-priority priority;
        disable;
        forward-delay seconds;
        hello-time seconds;
        interface (all | interface-name) {
            arp-on-stp;
            bpd-timeout-action {
                block;
                log;
            }
            cost cost;
            disable;
            edge;
            mode mode;
            no-root-port;
            priority priority;
        }
        max-age seconds;
        traceoptions {
            file filename <files number > <size size > <no-stamp | no-world-readable |
            world-readable>;
            flag flag;
        }
    }
```

Hierarchy Level [edit protocols]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure Rapid Spanning Tree Protocol (RSTP). RSTP is defined in the IEEE 802.1D-2004 specification and is used to prevent loops in Layer 2 networks, which results in shorter convergence times than those provided by basic Spanning Tree Protocol (STP).

VSTP and RSTP can be configured concurrently. You can selectively configure up to 253 VLANs using VSTP; the remaining VLANs will be configured using RSTP. VSTP and RSTP are the only spanning-tree protocols that can be configured concurrently on the switch. See [“Configuring VSTP \(CLI Procedure\)” on page 87](#) for more information on configuring VSTP and RSTP concurrently.



**BEST PRACTICE:** Configure RSTP when you configure VSTP. RSTP overhead is minimal and this configuration ensures that a spanning-tree protocol is running on all VLANs on your switch, even when your switch is supporting more than 253 VLANs.

The remaining statements are explained separately.


|                                 |                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>                  | RSTP is enabled on all Ethernet switching interfaces.                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                          |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23</a></li> <li>• <a href="#">Understanding RSTP for EX Series and QFX Series Switches on page 7</a></li> </ul> |

## shutdown (BPDU Block)

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|                                 |                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | shutdown;                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options <b>bpdu-block interface</b> (all   [ <i>interface-name</i> ])]                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 12.2 for EX Series switches.                                                                                                                                                                                                 |
| <b>Description</b>              | Shut down all or specified interfaces to prevent spanning-tree protocol BPDUs (for STP, MSTP, RSTP, and VSTP) from entering the interfaces on which BPDU protection is configured.                                                                                    |
| <b>Default</b>                  | Not enabled                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                   |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches on page 16</a></li> <li>• <a href="#">Unblocking an Interface That Receives BPDUs in Error (CLI Procedure) on page 94</a></li> </ul> |

## stp (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> stp {   bpd-block-on-edge ;   bridge-priority <i>priority</i>;   disable;   forward-delay <i>seconds</i>;   hello-time <i>seconds</i>;   interface (all   <i>interface-name</i>) {     arp-on-stp;     bpd-timeout-action {       block;       log;     }     cost <i>cost</i>;     disable;     mode <i>mode</i>;     no-root-port;     priority <i>priority</i>;   }   max-age <i>seconds</i>;   traceoptions {     file <i>filename</i> &lt;files <i>number</i> &gt; &lt;size <i>size</i> &gt; &lt;no-stamp   world-readable       no-world-readable&gt;;     flag <i>flag</i>;   } } </pre> |
| <b>Hierarchy Level</b>          | [edit protocols],<br>[edit protocols rstp force-version]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | Configure Spanning Tree Protocol (STP). When you explicitly configure STP, the switches use the IEEE 802.1D 2004 specification, force version 0. This configuration runs a version of RSTP that is compatible with the classic, basic STP (defined in the IEEE 802.1D 1998 specification).                                                                                                                                                                                                                                                                                                            |
|                                 | <div>  <p><b>NOTE:</b> Although the <code>edge</code> configuration statement appears in the CLI on the switch, this statement has no effect on the switch operation if you configure it.</p> </div> <p>The remaining statements are explained separately.</p>                                                                                                                                                                                                                                                     |
| <b>Default</b>                  | STP is disabled. By default, RSTP is enabled on all Ethernet switching ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Related  
Documentation**

- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on EX Series Switches on page 60](#)
- [Configuring STP \(CLI Procedure\) on page 81](#)
- [Understanding STP for EX Series Switches on page 12](#)

## traceoptions (Spanning Trees)

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | <pre> traceoptions {     file <i>name</i> &lt;replace&gt; &lt;size <i>size</i>&gt; &lt;files <i>number</i>&gt; &lt;no-stamp&gt;       &lt;(world-readable   no-world-readable)&gt;;     flag <i>flag</i> &lt;<i>flag-modifier</i>&gt; &lt;disable&gt;; } </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>     | <pre> [edit protocols mpls], [edit protocols <b>mstp</b>], [edit protocols mvrp], [edit protocols <b>rstp</b>], [edit protocols <b>stp</b>], [edit protocols <b>vstp</b> <b>vlan</b> <i>vlan-id</i>] </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Release Information</b> | <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>         | Set protocol-level tracing options for MPLS, MVRP, STP, RSTP, MSTP, and VSTP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Default</b>             | Traceoptions is disabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Options</b>             | <p><b>disable</b>—(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 <b>all</b>.</p> <p><b>file <i>name</i></b>—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><b>files <i>number</i></b>—(Optional) Maximum number of trace files. When a trace file named <b><i>trace-file</i></b> reaches its maximum size, it is renamed <b><i>trace-file .0</i></b>, then <b><i>trace-file .1</i></b>, 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><b>Range:</b> 2 through 1000 files</p> <p><b>Default:</b> 1 trace file</p> <p><b><i>flag</i></b>—Tracing operation to perform. To specify more than one tracing operation, include multiple <b><i>flag</i></b> statements:</p> <ul style="list-style-type: none"> <li><b>all</b>—Trace all operations.</li> <li><b>all-failures</b>—Trace all failure conditions.</li> <li><b>bpd</b><b>u</b>—Trace BPDU reception and transmission. Note that you must also use <b>port-transmit-state-machine</b> in order to log transmit operations.</li> <li><b>bridge-detection-state-machine</b>—Trace the bridge detection state machine.</li> </ul> |

- **error**—Trace all failure conditions.
- **events**—Trace events of the protocol state machine.
- **pdu**—Trace PDUs that were received and sent.
- **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-select-state-machine**—Trace the port role selection state machine.
- **port-role-transit-state-machine**—Trace the port role transit 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.
- **socket**—Trace socket activity.
- **state-machine**—Trace state machine information.
- **state-machine-variables**—Trace when the state machine variables change.
- **timers**—Trace protocol timers.
- **topology-change-state-machine**—Trace the topology change state machine.

**no-stamp**—(Optional) Do not place timestamp information at the beginning of each line in the trace file.

**Default:** If you omit this option, timestamp information is placed at the beginning of each line of the tracing output.

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

**replace**—(Optional) Replace an existing trace file if there is one.

**Default:** If you do not include this option, tracing output is appended to an existing trace 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.

|                                 |                                                             |
|---------------------------------|-------------------------------------------------------------|
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.        |
|                                 | routing-control—To add this statement to the configuration. |

**Related Documentation**

- [show spanning-tree bridge on page 153](#)
- [show spanning-tree interface on page 163](#)
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
- [Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches on page 23](#)
- [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)
- [Understanding RSTP for EX Series and QFX Series Switches on page 7](#)
- [Understanding STP for EX Series Switches on page 12](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)
- [Understanding Multiple VLAN Registration Protocol \(MVRP\) on EX Series Switches](#)



## vlan (Spanning Trees)

**Syntax** `vlan (all | vlan-id | vlan-name) {`  
     `bridge-priority priority;`  
     `forward-delay seconds;`  
     `hello-time seconds;`  
     `interface interface-name {`  
         `bpdu-timeout-action {`  
             `block;`  
             `log;`  
         `}`  
     `cost cost;`  
     `disable;`  
     `edge;`  
     `mode mode;`  
     `no-root-port;`  
     `priority priority;`  
     `}`  
     `max-age seconds;`  
     `traceoptions {`  
         `file filename <files number > <size size > <no-stamp | world-readable |`  
         `no-world-readable>;`  
         `flag flag;`  
     `}`  
`}`

**Hierarchy Level** [edit protocols `mstp msti msti-id`]  
                     [edit protocols `vstp`]

**Release Information** Statement introduced in Junos OS Release 9.0 for EX Series switches.  
                           Statement updated with enhanced ? (CLI completion feature) functionality in Junos OS Release 9.5 for EX Series switches.

**Description** Configure the VLANs for a Multiple Spanning Tree Instance (MSTI) or VSTP instance.



**NOTE:** When you configure VSTP with the `set protocol vstp vlan all` command, `vlan-id 1` is excluded to be compatible with Cisco PVST+. If you want `vlan-id 1` to be included in VSTP, you must set it separately with the `set protocol vstp vlan 1` command.



**TIP:** To display a list of all configured VLANs on the system, including VLANs that are configured but not committed, type `?` after `vlan` or `vlangs` in your configuration mode command line. Note that only one VLAN is displayed for a VLAN range.

**Default** Not enabled.

**Options**    *vlan-id*—Numeric VLAN identifier.

*vlan-name*—Name of the VLAN.

              The remaining statements are explained separately.

**Required Privilege**    routing—To view this statement in the configuration.

**Level**                routing-control—To add this statement to the configuration.

- Related Documentation**
- [Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40](#)
  - [Understanding MSTP for EX Series and QFX Series Switches on page 4](#)

## vlan (VSTP)

```
Syntax  vlan (all | vlan-id | vlan-name) {
        bridge-priority priority;
        forward-delay seconds;
        hello-time seconds;
        interface (all | interface-name) {
            bpdu-timeout-action {
                block;
                log;
            }
            cost cost;
            disable;
            edge;
            mode mode;
            no-root-port;
            priority priority;
        }
        max-age seconds;
        traceoptions {
            file filename <files number > <size size > <no-stamp | world-readable |
            no-world-readable>;
            flag flag;
        }
    }
```

**Hierarchy Level** [edit protocols vstp]

**Release Information** Statement introduced in Junos OS Release 9.4 for EX Series switches.

**Description** Configure VSTP VLAN parameters.



**TIP:** To display a list of all configured VLANs on the system, including VLANs that are configured but not committed, type ? after vlan or vlans in your configuration mode command line. Note that only one VLAN is displayed for a VLAN range.

**Options** all—All VLANs.

*vlan-id*—Numeric VLAN identifier.

*vlan-range*—Name of the VLAN range.

The remaining statements are explained separately.

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

**Related Documentation**

- [Understanding VSTP for EX Series Switches and QFX Series Switches on page 14](#)

- *Configuring VLAN Spanning-Tree Protocol*

## vstp

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

**Hierarchy Level** [edit protocols]

**Release Information** Statement introduced in Junos OS Release 9.4 for EX Series switches.

**Description** Configure VLAN Spanning Tree Protocol (VSTP). VSTP is used to prevent loops in Layer 2 networks on a per-VLAN basis.

You can have a maximum of 253 VSTP VLANs per switch.

If the number of VLANs on your switch exceeds the VSTP VLAN limit, you must use the **vlan (Spanning Trees)** statement to specify which VLANs or VLAN groups use VSTP. You also cannot use the **vlan all** option to configure VSTP when your switch has more than the maximum allowed VSTP VLANs. To ensure all VLANs are running a spanning-tree protocol, run RSTP for networks with large numbers of VLANs.



**NOTE:** When you configure VSTP with the `set protocol vstp vlan all` command, VLAN ID 1 is not set; it is excluded so that the configuration is compatible with Cisco PVST+. If you want VLAN ID 1 to be included in the VSTP configuration

on your switch, you must set it separately with the `set protocol vstp vlan 1` command.



**NOTE:** Option `vlan all` is not supported in Junos OS Release 13.2X50.



**BEST PRACTICE:** Configure RSTP when you configure VSTP. RSTP overhead is minimal and this configuration ensures that some spanning tree protocol is running on all VLANs on your switch, even when your switch has more than the maximum number of allowed VSTP VLANs.

The remaining statements are explained separately.

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>                  | VSTP is not enabled by default.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                    |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree bridge on page 153</a></li><li>• <a href="#">show spanning-tree interface on page 163</a></li><li>• <a href="#">Configuring VSTP (CLI Procedure) on page 87</a></li><li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li><li>• <a href="#">Example: Configuring VSTP on QFX Series Switches and EX4600 Switches</a></li></ul> |

## PART 3

# Administration

- [Routine Monitoring on page 145](#)
- [Operational Commands on page 149](#)





## CHAPTER 5

# Routine Monitoring

- [Monitoring Spanning Tree Protocols on page 145](#)

## Monitoring Spanning Tree Protocols

### Purpose



**NOTE:** This topic applies only to the J-Web Application package.

Use the monitoring feature to view status and information about the spanning-tree protocol parameters on your EX Series switch.

### Action

To display spanning-tree protocol parameter details in the J-Web interface, select **Monitor** > **Switching** > **STP**.

To display spanning-tree protocol parameter details in the CLI, enter the following commands:

- **show spanning-tree interface**
- **show spanning-tree bridge**

### Meaning

[Table 14 on page 145](#) summarizes the spanning-tree protocol parameters.

**Table 14: Summary of Spanning Tree Protocols Output Fields**

| Field                                                         | Values                                                          |
|---------------------------------------------------------------|-----------------------------------------------------------------|
| Bridge Parameters                                             |                                                                 |
| Routing instance name                                         | Displays bridge information for the specified routing instance. |
| <b>NOTE:</b> The option is supported only on EX4300 switches. |                                                                 |
| Context ID                                                    | An internally generated identifier.                             |
| Enabled Protocol                                              | Spanning-tree protocol type enabled.                            |

Table 14: Summary of Spanning Tree Protocols Output Fields (*continued*)

| Field                                                          | Values                                                                                                                                                 |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Root ID                                                        | Bridge ID of the elected spanning-tree root bridge.<br><br>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.                                                                                       |
| Bridge ID                                                      | Locally configured bridge ID.                                                                                                                          |
| Hello time                                                     | The time for which the bridge interface remains in the listening or learning state.                                                                    |
| Forward delay                                                  | The time for which the bridge interface remains in the listening or learning state before transitioning to the forwarding state.                       |
| Extended System ID                                             | The system ID.                                                                                                                                         |
| Inter Instance ID                                              | An internally generated instance identifier.                                                                                                           |
| Maximum age                                                    | Maximum age of received bridge protocol data units (BPDUs).                                                                                            |
| Number of topology changes                                     | Total number of spanning-tree protocol topology changes detected since the switch last booted.                                                         |
| Time since last topology change                                | Number of seconds elapsed since the last topology change.                                                                                              |
| <b>NOTE:</b> This option is supported only on EX4300 switches. |                                                                                                                                                        |
| Spanning Tree Interface Details                                |                                                                                                                                                        |
| Interface Name                                                 | Interface configured to participate in the spanning-tree protocol instance.                                                                            |
| Port ID                                                        | Logical interface identifier configured to participate in the spanning-tree protocol instance.                                                         |
| Designated Port ID                                             | Port ID of the designated port for the LAN segment to which the interface is attached.                                                                 |
| Designated Bridge ID                                           | ID of the designated bridge to which the interface is attached.                                                                                        |
| Port Cost                                                      | Configured cost for the interface.                                                                                                                     |

Table 14: Summary of Spanning Tree Protocols Output Fields (*continued*)

| Field                                 | Values                                                                                                                                                                                   |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port State                            | Spanning-tree protocol port state: <ul style="list-style-type: none"><li>• Forwarding (FWD)</li><li>• Blocking (BLK)</li><li>• Listening</li><li>• Learning</li><li>• Disabled</li></ul> |
| Role                                  | MSTP or RSTP port role, Designated (DESG), backup (BKUP), alternate (ALT), or root.                                                                                                      |
| Spanning Tree Statistics of Interface |                                                                                                                                                                                          |
| Interface                             | Interface for which statistics is being displayed.                                                                                                                                       |
| BPDUs Sent                            | Total number of BPDUs sent.                                                                                                                                                              |
| BPDUs Received                        | Total number of BPDUs received.                                                                                                                                                          |
| Next BPDU Transmission                | Number of seconds until the next BPDU is scheduled to be sent.                                                                                                                           |

- Related Documentation
- [show spanning-tree interface on page 163](#)
  - [show spanning-tree bridge on page 153](#)
  - [Configuring Spanning Tree Protocols \(J-Web Procedure\) on page 82](#)



## CHAPTER 6

# Operational Commands

- clear bpd-error
- clear spanning-tree statistics
- clear spanning-tree statistics
- show spanning-tree bridge
- show spanning-tree bridge
- show spanning-tree interface
- show spanning-tree interface
- show spanning-tree mstp configuration
- show spanning-tree mstp configuration
- show spanning-tree statistics
- show spanning-tree statistics

## clear bpdv-error

---

|                                 |                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>clear bpdv-error interface <i>interface-name</i></code>                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.1 for EX Series switches. Command updated in Junos OS Release 11.1 for EX Series switches—a BPDv error shuts down the interface and this command brings the interface back up.<br>Command introduced in Junos OS Release 11.1 for the QFX Series.                  |
| <b>Description</b>              | Clear bridge protocol data unit (BPDv) errors from an interface and bring up the interface.                                                                                                                                                                                                                 |
| <b>Options</b>                  | <i>interface-name</i> —Clear BPDv errors on the specified interface.                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | clear                                                                                                                                                                                                                                                                                                       |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">show spanning-tree interface on page 167</a></li><li>• <a href="#">Understanding BPDv Protection for STP, RSTP, and MSTP on EX Series Switches on page 16</a></li><li>• <a href="#">Understanding BPDv Protection for STP, RSTP, and MSTP</a></li></ul> |
| <b>List of Sample Output</b>    | <a href="#">clear bpdv-error interface on page 150</a>                                                                                                                                                                                                                                                      |

### Sample Output

#### clear bpdv-error interface

```
user@switch> clear bpdv-error interface xe-0/0/1.0
```

## clear spanning-tree statistics

---

|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | clear spanning-tree statistics<br><interface <i>interface-name</i> unit <i>logical-unit-number</i> >;                                                                                                                                                                    |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                       |
| <b>Description</b>              | Reset STP statistics for the all interfaces or a specified interface.                                                                                                                                                                                                    |
| <b>Options</b>                  | <p><b>none</b>—Reset STP counters for all interfaces.</p> <p><b><i>interface-name</i></b> —(Optional) The name of the interface for which statistics should be reset.</p> <p><b><i>logical-unit-number</i></b> —(Optional) The logical unit number of the interface.</p> |
| <b>Required Privilege Level</b> | clear                                                                                                                                                                                                                                                                    |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> </ul>             |
| <b>List of Sample Output</b>    | <a href="#">clear spanning-tree statistics on page 151</a>                                                                                                                                                                                                               |
| <b>Output Fields</b>            | This command produces no output.                                                                                                                                                                                                                                         |


## Sample Output

### clear spanning-tree statistics

```
user@switch> clear spanning-tree statistics
```

## clear spanning-tree statistics

---

|                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of Syntax</b>                                                                                                                                                             | <a href="#">Syntax on page 152</a><br><a href="#">Syntax (EX Series Switches and the QFX Series) on page 152</a>                                                                                                                                                                                                        |
| <b>Syntax</b>                                                                                                                                                                     | clear spanning-tree statistics<br><interface <i>interface-name</i> ><br><logical-system <i>logical-system-name</i> >                                                                                                                                                                                                    |
| <b>Syntax (EX Series Switches and the QFX Series)</b>                                                                                                                             | clear spanning-tree statistics<br><interface <i>interface-name</i> >                                                                                                                                                                                                                                                    |
| <b>Release Information</b>                                                                                                                                                        | Command introduced in Junos OS Release 8.4.<br>Command introduced in Junos OS Release 9.0 for EX Series switches.<br>Command introduced in Junos OS Release 11.1 for the QFX Series.                                                                                                                                    |
| <b>Description</b>                                                                                                                                                                | Clear Spanning Tree Protocol statistics.                                                                                                                                                                                                                                                                                |
| <b>Options</b>                                                                                                                                                                    | <b>none</b> —Reset STP counters for all interfaces for all routing instances.<br><br><b>interface <i>interface-name</i></b> —(Optional) Clear STP statistics for the specified interface only.<br><br><b>logical-system <i>logical-system-name</i></b> —(Optional) Clear STP statistics on a particular logical system. |
| <div> <b>NOTE:</b> The <b>logical-system</b> option is not available on QFabric systems.</div> |                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b>                                                                                                                                                   | clear                                                                                                                                                                                                                                                                                                                   |
| <b>Related Documentation</b>                                                                                                                                                      | <ul style="list-style-type: none"><li><a href="#">show spanning-tree statistics on page 179</a></li></ul>                                                                                                                                                                                                               |
| <b>List of Sample Output</b>                                                                                                                                                      | <a href="#">clear stp statistics on page 152</a>                                                                                                                                                                                                                                                                        |

### Sample Output

#### clear stp statistics

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



## show spanning-tree bridge

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | show spanning-tree bridge<br><brief   detail><br><msti <i>msti-id</i> ><br><vlan <i>vlan-id</i> >                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | Display the configured or calculated spanning-tree protocol (can be either STP, RSTP, MSTP, or VSTP) parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Options</b>                  | <p><b>none</b>—(Optional) Display brief spanning-tree protocol bridge information for all Multiple Spanning Tree Instances (MSTIs).</p> <p><b>brief   detail</b>—(Optional) Display the specified level of output.</p> <p><b>msti <i>msti-id</i></b>—(Optional) Display spanning-tree protocol bridge information for the specified MSTI or Common and Internal Spanning Tree (CIST). Specify <b>0</b> for CIST. Specify a value from <b>1</b> through <b>4094</b> for an MSTI.</p> <p><b>vlan <i>vlan-id</i></b>—(Optional) Display spanning-tree protocol bridge information for the specified VLAN. Specify a VLAN tag identifier from <b>1</b> through <b>4094</b>.</p> |
| <b>Required Privilege Level</b> | view                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree interface on page 163</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding RSTP for EX Series and QFX Series Switches on page 7</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                                                                                                                      |
| <b>List of Sample Output</b>    | <a href="#">show spanning-tree bridge on page 156</a><br><a href="#">show spanning-tree bridge brief on page 156</a><br><a href="#">show spanning-tree bridge detail on page 157</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Output Fields</b>            | Table 15 on page 153 lists the output fields for the <b>show spanning-tree bridge</b> command. Output fields are listed in the approximate order in which they appear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Table 15: show spanning-tree bridge Output Fields**

| Field Name        | Field Description                   | Level of Output                       |
|-------------------|-------------------------------------|---------------------------------------|
| <b>Context ID</b> | An internally generated identifier. | VSTP all, RSTP all, MSTP all, STP all |

Table 15: show spanning-tree bridge Output Fields (*continued*)

| Field Name                             | Field Description                                                                                                                               | Level of Output                       |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <b>Enabled protocol</b>                | Spanning-tree protocol type enabled.                                                                                                            | VSTP all, RSTP all, MSTP all, STP all |
| <b>Root ID</b>                         | 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. | VSTP all, RSTP all, MSTP all, STP all |
| <b>Root cost</b>                       | Calculated cost to reach the root bridge from the bridge where the command is entered.                                                          | VSTP all                              |
| <b>Root port</b>                       | Interface that is the current elected root port for this bridge.                                                                                | VSTP all                              |
| <b>CIST regional root</b>              | Bridge ID of the elected MSTP regional root bridge.                                                                                             | MSTP all                              |
| <b>CIST internal root cost</b>         | Calculated cost to reach the regional root bridge from the bridge where the command is entered.                                                 | MSTP all                              |
| <b>Hello time</b>                      | Configured number of seconds between transmissions of configuration BPDUs.                                                                      | VSTP all, RSTP all, MSTP all, STP all |
| <b>Maximum age</b>                     | Maximum age of received protocol BPDUs.                                                                                                         | VSTP all, RSTP all, MSTP all, STP all |
| <b>Forward delay</b>                   | Configured time an STP bridge port remains in the listening and learning states before transitioning to the forwarding state.                   | VSTP all, RSTP all, MSTP all, STP all |
| <b>Message age</b>                     | Number of seconds elapsed since the most recent BPDU was received.                                                                              | VSTP all, RSTP all, STP all           |
| <b>Number of topology changes</b>      | Total number of STP topology changes detected since the switch last booted.                                                                     | VSTP all, RSTP all, MSTP all, STP all |
| <b>Time since last topology change</b> | Number of seconds elapsed since the most recent topology change.                                                                                | RSTP detail                           |
| <b>Topology change initiator</b>       | Interface name of the interface that received the topology change request.                                                                      | RSTP detail                           |

Table 15: show spanning-tree bridge Output Fields (*continued*)

| Field Name                              | Field Description                                                                                                                     | Level of Output                                   |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <b>Topology change last recvd. from</b> | Bridge ID of the bridge that requested the last topology change.                                                                      | RSTP detail                                       |
| <b>Bridge ID (local)</b>                | Locally configured bridge ID. The bridge ID consists of a configurable bridge priority and the MAC address of the bridge.             | VSTP all, RSTP all, MSTP all, STP all             |
| <b>Extended system ID (local)</b>       | Internally generated system identifier.                                                                                               | VSTP all, RSTP all, MSTP all, STP all             |
| <b>MSTI regional root</b>               | Bridge ID of the elected MSTP regional root bridge.                                                                                   | MSTP detail                                       |
| <b>Internal instance ID (local)</b>     | An internally generated identifier.                                                                                                   | VSTP all, RSTP all, MSTP all, STP all             |
| <b>Hello time (local)</b>               | Configured number of seconds between transmissions of configuration BPDUs.                                                            | RSTP detail, MSTP detail, STP detail              |
| <b>Maximum age (local)</b>              | Maximum age of received protocol BPDUs.                                                                                               | VSTP detail, RSTP detail, MSTP detail, STP detail |
| <b>Forward delay (local)</b>            | Configured time an STP bridge port remains in the listening and learning states before transitioning to the forwarding state.         | RSTP detail, MSTP detail, STP detail              |
| <b>Path Cost Method (local)</b>         | Bridges supporting 802.1D (legacy) implement only 16-bit values for path cost. Newer versions of this standard support 32-bit values. | VSTP detail, RSTP detail, MSTP detail, STP detail |
| <b>Maximum Hop count (local)</b>        | Configured maximum number of hops a BPDU can be forwarded in the MSTP region.                                                         | MSTP detail                                       |

## Sample Output

### show spanning-tree bridge

```

user@switch> show spanning-tree bridge
STP bridge parameters
Context ID : 0
Enabled protocol : MSTP

STP bridge parameters for CIST
Root ID : 32768.00:11:f2:56:df:40
Root cost : 0
Root port : ge-0/0/1.0
CIST regional root : 32768.00:11:f2:56:df:40
CIST internal root cost : 20000
Hello time : 2 seconds
Maximum age : 20 seconds
Forward delay : 15 seconds
Hop count : 19
Message age : 0
Number of topology changes : 1
Time since last topology change : 108 seconds
Topology change initiator : ge-0/0/1.0
Topology change last recvd. from : 00:11:f2:56:df:4c
Local parameters
Bridge ID : 32768.00:11:f2:57:1c:00
Extended system ID : 0
Internal instance ID : 0

STP bridge parameters for MSTI 10
MSTI regional root : 32778.00:11:f2:56:df:40
Root cost : 20000
Root port : ge-0/0/1.0
Hello time : 2 seconds
Maximum age : 20 seconds
Forward delay : 15 seconds
Hop count : 19
Number of topology changes : 1
Time since last topology change : 108 seconds
Topology change initiator : ge-0/0/1.0
Topology change last recvd. from : 00:11:f2:56:df:41
Local parameters
Bridge ID : 32778.00:11:f2:57:1c:00
Extended system ID : 0
Internal instance ID : 1

```

### show spanning-tree bridge brief

```

user@switch> show spanning-tree bridge brief
STP bridge parameters
Context ID : 0
Enabled protocol : RSTP
Root ID : 32768.00:19:e2:50:95:a0
Hello time : 2 seconds
Maximum age : 20 seconds
Forward delay : 15 seconds
Message age : 0
Number of topology changes : 0
Local parameters
Bridge ID : 32768.00:19:e2:50:95:a0

```

```
Extended system ID      : 0
Internal instance ID    : 0
```

### show spanning-tree bridge detail

```
user@switch> show spanning-tree bridge detail
```

```
STP bridge parameters
Context ID          : 0
Enabled protocol    : RSTP
Root ID             : 32768.00:19:e2:50:95:a0
Hello time          : 2 seconds
Maximum age         : 20 seconds
Forward delay       : 15 seconds
Message age         : 0
Number of topology changes : 0
Local parameters
Bridge ID           : 32768.00:19:e2:50:95:a0
Extended system ID  : 0
Internal instance ID : 0
Hello time          : 2 seconds
Maximum age         : 20 seconds
Forward delay       : 15 seconds
Path cost method    : 32 bit
```

## show spanning-tree bridge

**List of Syntax** [Syntax on page 158](#)  
[Syntax \(QFX Series\) on page 158](#)

**Syntax** show spanning-tree bridge  
 <brief | detail>  
 <msti *msti-id*>  
 <routing-instance *routing-instance-name*>  
 <vlan-id *vlan-id*>

**Syntax (QFX Series)** show spanning-tree bridge  
 <brief | detail>  
 <msti *msti-id*>  
 <vlan-id *vlan-id*>

**Release Information** Command introduced in Junos OS Release 8.4.  
 Command introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Display the configured or calculated Spanning Tree Protocol (STP) parameters.

**Options** **none**—(Optional) Display brief STP bridge information for all multiple spanning-tree instances (MSTIs).

**brief | detail**—(Optional) Display the specified level of output.

**msti *msti-id***—(Optional) Display STP bridge information for the specified MSTI.

**routing-instance *routing-instance-name***—(Optional) Display STP bridge information for the specified routing instance.

**vlan-id *vlan-id***—(Optional) Display STP bridge information for the specified VLAN.

**Required Privilege Level** view

**List of Sample Output** [show spanning-tree bridge routing-instance on page 159](#)  
[show spanning-tree bridge msti on page 160](#)  
[show spanning-tree bridge vlan-id \(MSTP\) on page 161](#)  
[show spanning-tree bridge \(RSTP\) on page 161](#)  
[show spanning-tree bridge vlan-id \(RSTP\) on page 162](#)

**Output Fields** [Table 16 on page 158](#) lists the output fields for the **show spanning-tree bridge** command. Output fields are listed in the approximate order in which they appear.

**Table 16: 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 16: 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

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>show spanning-tree interface &lt;brief   detail&gt; &lt;interface-name <i>interface-name</i>&gt; &lt;msti <i>msti-id</i>&gt; &lt;vlan-id <i>vlan-id</i>&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Display the configured or calculated interface-level spanning-tree protocol (can be either STP, RSTP, or MSTP) parameters. In <b>brief</b> mode, will not display interfaces that are administratively disabled or do not have a physical link.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Options</b>                  | <p><b>none</b>—(Optional) Display brief STP interface information.</p> <p><b>brief   detail</b>—(Optional) Display the specified level of output.</p> <p><b>interface-name <i>interface-name</i></b>—(Optional) Name of an interface.</p> <p><b>msti <i>msti-id</i></b>—(Optional) Display STP bridge information for the specified MSTP instance ID or Common and Internal Spanning Tree (CIST). Specify <b>0</b> for CIST. Specify a value from 1 through <b>4094</b> for an MSTI.</p> <p><b>vlan-id <i>vlan-id</i></b>—(Optional) For MSTP interfaces, display interface information for the specified VLAN. Specify a value from <b>0</b> through <b>4094</b>.</p> |
| <b>Required Privilege Level</b> | view                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding RSTP for EX Series and QFX Series Switches on page 7</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul>                                                      |
| <b>List of Sample Output</b>    | <a href="#">show spanning-tree interface on page 164</a><br><a href="#">show spanning-tree interface brief on page 165</a><br><a href="#">show spanning-tree interface detail on page 165</a><br><a href="#">show spanning-tree interface ge-1/0/0 on page 166</a>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Output Fields</b>            | <a href="#">Table 17 on page 164</a> lists the output fields for the <b>show spanning-tree interface</b> command. Output fields are listed in the approximate order in which they appear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Table 17: show spanning-tree interface Output Fields

| Field Name                    | Field Description                                                                                                 |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Interface name                | Interface configured to participate in the STP, RSTP, or MSTP instance.                                           |
| Port ID                       | Logical interface identifier configured to participate in the MSTP instance.                                      |
| Designated port ID            | Port ID of the designated port for the LAN segment this interface is attached to.                                 |
| Designated bridge ID          | Bridge ID of the designated bridge for the LAN segment this interface is attached to.                             |
| Port Cost                     | Configured cost for the interface.                                                                                |
| Port State                    | STP port state. Forwarding (FWD), blocking (BLK), listening, learning, or disabled.                               |
| Port Role                     | MSTP or RSTP port role. Designated (DESG), backup (BKUP), alternate (ALT), (ROOT), or Root Prevented (Root-Prev). |
| Link type                     | MSTP or RSTP link type. Shared or point-to-point (pt-pt) and edge or non edge.                                    |
| Alternate                     | Identifies the interface as an MSTP or RSTP alternate root port (yes) or non-alternate root port (no).            |
| Boundary Port                 | Identifies the interface as an MSTP regional boundary port (yes) or non-boundary port (no).                       |
| Edge delay while expiry count | Number of times the edge delay timer expired on that interface.                                                   |
| Rcvd info while expiry count  | Number of times the rcvd info timer expired on that interface.                                                    |

## Sample Output

### show spanning-tree interface

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

```
Spanning tree interface parameters for instance 0
```

| Interface   | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/0.0  | 128:513 | 128:513               | 8192.0019e2500340       | 1000         | FWD   | DESG |
| ge-0/0/2.0  | 128:515 | 128:515               | 8192.0019e2500340       | 1000         | BLK   | DIS  |
| ge-0/0/4.0  | 128:517 | 128:517               | 8192.0019e2500340       | 1000         | FWD   | DESG |
| ge-0/0/23.0 | 128:536 | 128:536               | 8192.0019e2500340       | 1000         | FWD   | DESG |

```
Spanning tree interface parameters for instance 1
```

| Interface  | Port ID | Designated<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|------------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/0.0 | 128:513 | 128:513               | 8193.0019e2500340       | 1000         | FWD   | DESG |
| ge-0/0/2.0 | 128:515 | 128:515               | 8193.0019e2500340       | 1000         | BLK   | DIS  |
| ge-0/0/4.0 | 128:517 | 128:517               | 8193.0019e2500340       | 1000         | FWD   | DESG |

```
ge-0/0/23.0 128:536 128:536 8193.0019e2500340 1000 FWD DESG
```

Spanning tree interface parameters for instance 2

| Interface   | Port ID | Designated port ID | Designated bridge ID | Port Cost | State | Role |
|-------------|---------|--------------------|----------------------|-----------|-------|------|
| ge-0/0/0.0  | 128:513 | 128:1              | 8194.001b549fd000    | 1000      | FWD   | ROOT |
| ge-0/0/2.0  | 128:515 | 128:515            | 32770.0019e2500340   | 4000      | BLK   | DIS  |
| ge-0/0/4.0  | 128:517 | 128:1              | 16386.001b54013080   | 1000      | BLK   | ALT  |
| ge-0/0/23.0 | 128:536 | 128:536            | 32770.0019e2500340   | 1000      | FWD   | DESG |

### show spanning-tree interface brief

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

| Interface   | Port ID | Designated port ID | Designated bridge ID | Port Cost | State | Role |
|-------------|---------|--------------------|----------------------|-----------|-------|------|
| ge-1/0/0.0  | 128:625 | 128:625            | 32768.0019e25095a0   | 20000     | BLK   | DIS  |
| ge-1/0/1.0  | 128:626 | 128:626            | 32768.0019e25095a0   | 20000     | BLK   | DIS  |
| ge-1/0/2.0  | 128:627 | 128:627            | 32768.0019e25095a0   | 20000     | BLK   | DIS  |
| ge-1/0/10.0 | 128:635 | 128:635            | 32768.0019e25095a0   | 20000     | BLK   | DIS  |
| ge-1/0/20.0 | 128:645 | 128:645            | 32768.0019e25095a0   | 20000     | BLK   | DIS  |
| ge-1/0/30.0 | 128:655 | 128:655            | 32768.0019e25095a0   | 20000     | BLK   | DIS  |

### show spanning-tree interface detail

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

```
Interface name      : ge-1/0/0.0
Port identifier     : 128.625
Designated port ID  : 128.625
Port cost           : 20000
Port state          : Blocking
Designated bridge ID : 32768.00:19:e2:50:95:a0
Port role           : Disabled
Link type           : Pt-Pt/EDGE
Boundary port       : NA
Edge delay while expiry count : 0
Rcvd info while expiry count  : 0
```

```
Interface name      : ge-1/0/1.0
Port identifier     : 128.626
Designated port ID  : 128.626
Port cost           : 20000
Port state          : Blocking
Designated bridge ID : 32768.00:19:e2:50:95:a0
Port role           : Disabled
Link type           : Pt-Pt/NONEDGE
Boundary port       : NA
Edge delay while expiry count : 0
Rcvd info while expiry count  : 0
```

```
Interface name      : ge-1/0/2.0
Port identifier     : 128.627
Designated port ID  : 128.627
Port cost           : 20000
Port state          : Blocking
Designated bridge ID : 32768.00:19:e2:50:95:a0
```

```
Port role      : Disabled
Link type      : Pt-Pt/NONEDGE
Boundary port   : NA
Edge delay while expiry count : 0
Rvcd info while expiry count  : 0

Interface name   : ge-1/0/10.0
Port identifier   : 128.635
Designated port ID : 128.635
Port cost        : 20000
Port state       : Blocking
Designated bridge ID : 32768.00:19:e2:50:95:a0
Port role        : Disabled
Link type        : Pt-Pt/NONEDGE
Boundary port     : NA
Edge delay while expiry count : 0
Rvcd info while expiry count  : 0

Interface name   : ge-1/0/20.0
Port identifier   : 128.645
Designated port ID : 128.645
Port cost        : 20000
Port state       : Blocking
Designated bridge ID : 32768.00:19:e2:50:95:a0
Port role        : Disabled
Link type        : Pt-Pt/NONEDGE
Boundary port     : NA
Edge delay while expiry count : 0
Rvcd info while expiry count  : 0
[output truncated]
```

#### show spanning-tree interface ge-1/0/0

```
user@switch> show spanning-tree interface ge-1/0/0
```

| Interface  | Port ID | Designated | Designated         | Port  | State | Role |
|------------|---------|------------|--------------------|-------|-------|------|
|            | port ID | bridge ID  | Cost               |       |       |      |
| ge-1/0/0.0 | 128:625 | 128:625    | 32768.0019e25095a0 | 20000 | BLK   | DIS  |

## show spanning-tree interface

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of Syntax</b>                                 | <a href="#">Syntax on page 167</a><br><a href="#">Syntax (EX Series Switches and the QFX Series) on page 167</a>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Syntax</b>                                         | <pre>show spanning-tree interface &lt;brief   detail&gt; &lt;msti <i>msti-id</i>&gt; &lt;routing-instance <i>routing-instance-name</i>&gt; &lt;vlan-id <i>vlan-id</i>&gt;</pre>                                                                                                                                                                                                                                                                                                                          |
| <b>Syntax (EX Series Switches and the QFX Series)</b> | <pre>show spanning-tree interface &lt;brief   detail&gt; &lt;msti <i>msti-id</i>&gt; &lt;vlan-id <i>vlan-id</i>&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>                            | <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>                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>                                    | Display the configured or calculated interface-level STP parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Options</b>                                        | <p><b>none</b>—Display brief STP interface information.</p> <p><b>brief   detail</b>—(Optional) Display the specified level of output.</p> <p><b>msti <i>msti-id</i></b>—(Optional) Display STP interface information for the specified MSTI.</p> <p><b>routing-instance <i>routing-instance-name</i></b>—(Optional) Display STP interface information for the specified routing instance.</p> <p><b>vlan-id <i>vlan-id</i></b>—(Optional) Display STP interface information for the specified VLAN.</p> |
| <b>Required Privilege Level</b>                       | view                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>List of Sample Output</b>                          | <a href="#">show spanning-tree interface on page 168</a><br><a href="#">show spanning-tree interface (QFX Series) on page 169</a><br><a href="#">show spanning-tree interface detail on page 169</a><br><a href="#">show spanning-tree interface msti on page 171</a><br><a href="#">show spanning-tree interface vlan-id on page 171</a><br><a href="#">show spanning-tree interface (VSTP) on page 172</a><br><a href="#">show spanning-tree interface vlan-id (VSTP) on page 172</a>                  |
| <b>Output Fields</b>                                  | <p><a href="#">Table 18 on page 167</a> lists the output fields for the <b>show spanning-tree interface</b> command. Output fields are listed in the approximate order in which they appear.</p>                                                                                                                                                                                                                                                                                                         |

**Table 18: show spanning-tree interface Output Fields**

| Field Name            | Field Description                                                             |
|-----------------------|-------------------------------------------------------------------------------|
| <b>Interface name</b> | Interface configured to participate in the STP, RSTP, VSTP, or MSTP instance. |

Table 18: show spanning-tree interface Output Fields (*continued*)

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

## 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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>bridge ID | Port<br>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<br>port ID | Designated<br>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<br>port ID | Designated<br>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<br>port ID | Designated<br>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<br>port ID | Designated<br>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

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | show spanning-tree mstp configuration<br><brief   detail>                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | Display the MSTP configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Options</b>                  | <b>none</b> —Display MSTP configuration information.<br><b>brief   detail</b> —(Optional) Display the specified level of output.                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | view                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">show spanning-tree statistics on page 177</a></li> <li>• <a href="#">mstp (Spanning Trees) on page 126</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> </ul> |
| <b>List of Sample Output</b>    | <a href="#">show spanning-tree mstp configuration on page 174</a>                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Output Fields</b>            | <a href="#">Table 19 on page 173</a> lists the output fields for the <b>show spanning-tree mstp configuration</b> command. Output fields are listed in the approximate order in which they appear.                                                                                                                                                                                                                                                             |

**Table 19: show spanning-tree mstp configuration Output Fields**

| Field Name           | Field Description                                                |
|----------------------|------------------------------------------------------------------|
| Context identifier   | 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                 | MSTI instance identifier.                                        |
| Member VLANs         | Identifiers for VLANs associated with the MSTI.                  |

## Sample Output

### show spanning-tree mstp configuration

```
user@host> show spanning-tree mstp configuration
MSTP configuration information
Context identifier      : 0
Region name            : region1
Revision               : 0
Configuration digest    : 0xc92e7af9febb44d8df928b87f16b
```

```
MSTI      Member VLANs
0 0-100,105-4094
1 101-102
2 103-104
```

## show spanning-tree mstp configuration

|                                                     |                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of Syntax</b>                               | <a href="#">Syntax on page 175</a><br><a href="#">Syntax (EX Series Switch and the QFX Series) on page 175</a>                                                                                                                                                   |
| <b>Syntax</b>                                       | show spanning-tree mstp configuration<br><brief   detail><br><routing-instance <i>routing-instance-name</i> >                                                                                                                                                    |
| <b>Syntax (EX Series Switch and the QFX Series)</b> | show spanning-tree mstp configuration<br><brief   detail>                                                                                                                                                                                                        |
| <b>Release Information</b>                          | Command introduced in Junos OS Release 8.4.<br>Command introduced in Junos OS Release 9.0 for EX Series switches.<br>Command introduced in Junos OS Release 11.1 for the QFX Series.                                                                             |
| <b>Description</b>                                  | Display the MSTP configuration.                                                                                                                                                                                                                                  |
| <b>Options</b>                                      | none—Display MSTP configuration information.<br><br>brief   detail—(Optional) Display the specified level of output.<br><br>routing-instance <i>routing-instance-name</i> —(Optional) Display MSTP configuration information for the specified routing instance. |
| <b>Required Privilege Level</b>                     | view                                                                                                                                                                                                                                                             |
| <b>List of Sample Output</b>                        | <a href="#">show spanning-tree mstp configuration detail on page 176</a><br><a href="#">show spanning-tree mstp configuration detail (QFX Series) on page 176</a>                                                                                                |
| <b>Output Fields</b>                                | Table 20 on page 175 lists the output fields for the <b>show spanning-tree mstp configuration</b> command. Output fields are listed in the approximate order in which they appear.                                                                               |

**Table 20: 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                 | MSTI identifier.                                                 |
| Member VLANs         | VLAN identifiers associated with the MSTI.                       |

## Sample Output

### show spanning-tree mstp configuration detail

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

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

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

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

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



## show spanning-tree statistics

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | show spanning-tree statistics<br>interface <i>interface-name</i><br>vlan <i>vlan-id</i><br><brief   detail>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.0 for EX Series switches.<br>Option <b>vlan</b> <i>vlan-id</i> introduced in Junos OS Release 10.1 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | Display STP statistics on an interface, or for a VLAN when VSTP is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Options</b>                  | <p><b>none</b>—Display brief STP statistics.</p> <p><b>brief   detail</b>—(Optional) Display the specified level of output.</p> <p><b>interface</b> <i>interface-name</i>—(Optional) The name of the interface.</p> <p><b>vlan</b> <i>vlan-id</i>—(Optional) The name of a VLAN.</p>                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | view                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">show spanning-tree bridge on page 153</a></li> <li>• <a href="#">Example: Configuring Network Regions for VLANs with MSTP on EX Series Switches on page 40</a></li> <li>• <a href="#">Understanding STP for EX Series Switches on page 12</a></li> <li>• <a href="#">Understanding RSTP for EX Series and QFX Series Switches on page 7</a></li> <li>• <a href="#">Understanding MSTP for EX Series and QFX Series Switches on page 4</a></li> <li>• <a href="#">Understanding VSTP for EX Series Switches and QFX Series Switches on page 14</a></li> </ul> |
| <b>List of Sample Output</b>    | <a href="#">show spanning-tree statistics interface on page 178</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Output Fields</b>            | <a href="#">Table 21 on page 177</a> lists the output fields for the <b>show spanning-tree statistics</b> command. Output fields are listed in the approximate order in which they appear.                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Table 21: show spanning-tree statistics Output Fields**

| Field Name             | Field Description                                              |
|------------------------|----------------------------------------------------------------|
| BPDUs sent             | Total number of BPDUs sent.                                    |
| BPDUs received         | Total number of BPDUs received.                                |
| 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 interface

```
user@switch> show spanning-tree statistics interface ge-0/0/4
Interface  BPDUs sent  BPDUs received  Next BPU
              transmission
ge-0/0/4    7    190    0
```

## show spanning-tree statistics

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of Syntax</b>                               | <a href="#">Syntax on page 179</a><br><a href="#">Syntax (EX Series Switch and the QFX Series) on page 179</a>                                                                                                                                                                                                                                                                 |
| <b>Syntax</b>                                       | <pre>show spanning-tree statistics &lt;brief   detail&gt; &lt;interface <i>interface-name</i>&gt; &lt;routing-instance <i>routing-instance-name</i>&gt;</pre>                                                                                                                                                                                                                  |
| <b>Syntax (EX Series Switch and the QFX Series)</b> | <pre>show spanning-tree statistics &lt;brief   detail&gt; &lt;interface <i>interface-name</i>   vlan <i>vlan-id</i>&gt;</pre>                                                                                                                                                                                                                                                  |
| <b>Release Information</b>                          | <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>                                                                                                                                                                       |
| <b>Description</b>                                  | Display STP statistics.                                                                                                                                                                                                                                                                                                                                                        |
| <b>Options</b>                                      | <p><b>none</b>—Display brief STP statistics.</p> <p><b>brief   detail</b>—(Optional) Display the specified level of output.</p> <p><b>interface <i>interface-name</i></b>—(Optional) Display STP statistics for the specified interface.</p> <p><b>routing-instance <i>routing-instance-name</i></b>—(Optional) Display STP statistics for the specified routing instance.</p> |
| <b>Required Privilege Level</b>                     | view                                                                                                                                                                                                                                                                                                                                                                           |
| <b>List of Sample Output</b>                        | <a href="#">show spanning-tree statistics routing-instance on page 180</a><br><a href="#">show spanning-tree statistics interface routing-instance detail on page 180</a>                                                                                                                                                                                                      |
| <b>Output Fields</b>                                | <p><a href="#">Table 22 on page 179</a> lists the output fields for the <b>show spanning-tree statistics</b> command. Output fields are listed in the approximate order in which they appear.</p>                                                                                                                                                                              |

**Table 22: 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 interval     | Number of BPDUs sent within a specified interval.     |
| BPDUs received in last interval | Number of BPDUs received within a specified interval. |

Table 22: show spanning-tree statistics Output Fields (*continued*)

| Field Name                    | Field Description                                              |
|-------------------------------|----------------------------------------------------------------|
| <b>Interface</b>              | Interface for which the statistics are being displayed.        |
| <b>Next BPDU transmission</b> | 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
```