



Ethernet Switching Feature Guide for the NFX250 Network Services Platform

Release

15.1X53



Modified: 2016-04-18

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

Juniper Networks, Junos, Steel-Belted Radius, NetScreen, and ScreenOS are registered trademarks of Juniper Networks, Inc. in the United States and other countries. The Juniper Networks Logo, the Junos logo, and JunosE are trademarks of Juniper Networks, Inc. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Ethernet Switching Feature Guide for the NFX250 Network Services Platform
15.1X53
Copyright © 2016, Juniper Networks, Inc.
All rights reserved.

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

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at <http://www.juniper.net/support/eula.html>. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

| | | |
|------------------|--|----------|
| | About the Documentation | xiii |
| | Documentation and Release Notes | xiii |
| | Using the Examples in This Manual | xiii |
| | Merging a Full Example | xiv |
| | Merging a Snippet | xiv |
| | Documentation Conventions | xv |
| | Documentation Feedback | xvii |
| | Requesting Technical Support | xvii |
| | Self-Help Online Tools and Resources | xvii |
| | Opening a Case with JTAC | xviii |
| Part 1 | Bridging and VLANs | |
| Chapter 1 | Using Bridging and VLANs | 3 |
| | Overview of Layer 2 Networking | 3 |
| | Understanding Layer 2 Broadcasting | 5 |
| | Layer 2 Learning and Forwarding for VLANs Overview | 6 |
| | Understanding Bridging and VLANs | 7 |
| | History of VLANs | 7 |
| | How Bridging of VLAN Traffic Works | 8 |
| | Packets Are Either Tagged or Untagged | 9 |
| | Switch Interface Modes—Access, Trunk, or Tagged Access | 9 |
| | Access Mode | 10 |
| | Trunk Mode | 10 |
| | Trunk Mode and Native VLAN | 10 |
| | Tagged-Access Mode | 11 |
| | Additional Advantages of Using VLANs | 11 |
| | Maximum VLANs and VLAN Members Per Switch | 12 |
| | A Default VLAN Is Configured on Most Switches | 13 |
| | Assigning Traffic to VLANs | 13 |
| | Assign VLAN Traffic According to the Interface Port Source | 13 |
| | Assign VLAN Traffic According to the Source MAC Address | 14 |
| | Forwarding VLAN Traffic | 14 |
| | VLANs Communicate with Integrated Routing and Bridging Interfaces or Routed VLAN Interfaces | 14 |
| | Configuring VLANs | 14 |
| | Configuring the Native VLAN Identifier (CLI Procedure) | 16 |
| | Creating a Series of Tagged VLANs | 16 |
| | Understanding Integrated Routing and Bridging | 18 |
| | Example: Configuring Routing Between VLANs on One Switch | 20 |
| | Configuring IRB Interfaces | 25 |

| | | |
|------------------|--|-----------|
| | Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure) | 27 |
| | Configuring Static ARP Entries | 27 |
| | Troubleshooting Ethernet Switching | 28 |
| Part 2 | MAC Addresses | |
| Chapter 2 | Using MAC Addresses | 33 |
| | Introduction to the Media Access Control (MAC) Layer 2 Sublayer | 33 |
| | Understanding MAC Learning | 34 |
| | Disabling MAC Learning | 34 |
| | Example: Disabling MAC Learning | 35 |
| | Configuring MAC Notification (CLI Procedure) | 36 |
| | Enabling MAC Notification | 37 |
| | Disabling MAC Notification | 37 |
| | Setting the MAC Notification Interval | 37 |
| | Verifying That MAC Notification Is Working Properly | 37 |
| | Configuring MAC Limiting (CLI Procedure) | 38 |
| | Limiting the Number of MAC Addresses Learned by an Interface | 39 |
| | Limiting the Number of MAC Addresses Learned by a VLAN | 39 |
| | Configuring MAC Table Aging | 40 |
| Part 3 | Spanning Trees | |
| Chapter 3 | Using Spanning Trees | 43 |
| | Overview of Spanning-Tree Protocols | 43 |
| | Understanding Spanning Tree Protocols on a QFabric System | 44 |
| | Understanding RSTP | 45 |
| | Example: Configuring Faster Convergence and Improved Network Stability with RSTP | 46 |
| | Configuring RSTP (CLI Procedure) | 63 |
| | Understanding VSTP | 64 |
| | Configuring VSTP (CLI Procedure) | 65 |
| | Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations | 67 |
| | Configuring BPDU Protection on Spanning Tree Interfaces | 72 |
| | Unblocking an Interface That Receives BPDUs in Error (CLI Procedure) | 73 |
| Part 4 | Q-in-Q Tunneling | |
| Chapter 4 | Using Q-in-Q Tunneling | 77 |
| | Understanding Q-in-Q Tunneling | 77 |
| | How Q-in-Q Tunneling Works | 78 |
| | How VLAN Translation Works | 78 |
| | Sending and Receiving Untagged Packets | 78 |
| | Disabling MAC Address Learning | 79 |
| | Mapping C-VLANs to S-VLANs | 79 |
| | All-in-One Bundling | 79 |
| | Many-to-Many Bundling | 80 |
| | Mapping a Specific Interface | 80 |

| | | |
|------------------|---|------------|
| | Constraints for Q-in-Q Tunneling and VLAN Translation | 80 |
| | Configuring Q-in-Q Tunneling | 82 |
| | Using the Different Mapping Methods | 82 |
| | Configuring All-in-One Bundling | 83 |
| | Configuring Many-to-Many Bundling | 84 |
| | Configuring a Specific Interface Mapping with VLAN ID Translation Option | 87 |
| | Configuring All-in-One Bundling | 89 |
| | Configuring Many-to-Many Bundling | 91 |
| | Configuring a Specific Interface Mapping with VLAN ID Translation Option | 94 |
| Part 5 | Proxy ARP | |
| Chapter 5 | Using Proxy ARP | 99 |
| | Understanding Proxy ARP | 99 |
| | What Is ARP? | 99 |
| | Proxy ARP Overview | 99 |
| | Best Practices for Proxy ARP | 100 |
| | Configuring Proxy ARP (CLI Procedure) | 100 |
| | Verifying That Proxy ARP Is Working Correctly | 101 |
| Part 6 | Configuration Statements and Operational Commands | |
| Chapter 6 | VLAN Configuration Statements | 105 |
| | [edit vlans] Configuration Statement Hierarchy on the QFX Series | 105 |
| | Supported Statements in the [edit vlans] Hierarchy Level | 106 |
| | Unsupported Statements in the [edit vlans] Hierarchy Level | 108 |
| | description (VLAN) | 109 |
| | dhcp-relay | 110 |
| | filter (VLANs) | 115 |
| | forwarding-options | 116 |
| | interface (VLANs) | 121 |
| | interface-mac-limit | 122 |
| | interface-mode | 124 |
| | irb (Interfaces) | 126 |
| | l3-interface (VLAN) | 129 |
| | mac (Static MAC-Based VLANs) | 130 |
| | members | 131 |
| | native-vlan-id | 132 |
| | packet-action | 133 |
| | port-mode | 136 |
| | service-id | 137 |
| | switch-options | 138 |
| | static (Static MAC-Based VLANs) | 139 |
| | static-mac | 139 |
| | vlan-id (VLANs) | 140 |
| | vlan-id-list | 141 |
| | vlan-rewrite | 142 |
| | vlan-tagging | 143 |

| | | |
|------------------|---|------------|
| | vlan-tags | 144 |
| | vlangs | 145 |
| Chapter 7 | MAC Address Configuration Statements | 149 |
| | global-mac-table-aging-time | 149 |
| | mac-limit | 150 |
| | mac-notification | 151 |
| | mac-statistics | 152 |
| | mac-table-size | 154 |
| | notification-interval | 156 |
| Chapter 8 | STP Configuration Statements | 157 |
| | bpdu-block | 158 |
| | bpdu-block-on-edge | 159 |
| | bpdu-timeout-action | 160 |
| | bridge-priority (Spanning Trees) | 161 |
| | configuration-name | 162 |
| | cost | 163 |
| | disable (Spanning Trees) | 164 |
| | bpdu-block | 165 |
| | bpdu-block-on-edge | 166 |
| | bpdu-timeout-action | 167 |
| | bridge-priority (Spanning Trees) | 168 |
| | configuration-name | 169 |
| | cost | 170 |
| | disable (Spanning Trees) | 171 |
| | disable-timeout (Spanning Trees) | 172 |
| | edge | 173 |
| | force-version (IEEE 802.1D STP) | 174 |
| | forward-delay | 175 |
| | hello-time | 176 |
| | interface (BPDU) | 177 |
| | interface (Spanning Tree) | 178 |
| | max-age | 179 |
| | max-hops | 180 |
| | mode (Protocols STP) | 181 |
| | msti | 182 |
| | no-root-port | 183 |
| | priority (Protocols STP) | 184 |
| | protocol | 185 |
| | protocols (STP Type) | 186 |
| | revision-level | 187 |
| | rstp | 188 |
| | traceoptions (Spanning Tree) | 189 |
| | vlan (MSTP) | 192 |
| | vlan (VSTP) | 193 |
| | vlan (VSTP) | 194 |
| | vlan-group | 195 |
| | vstp | 196 |

| | | |
|-------------------|---|------------|
| Chapter 9 | Q-in-Q Configuration Statements | 199 |
| | flexible-vlan-tagging | 200 |
| | input-vlan-map | 201 |
| | native-vlan-id | 202 |
| | output-vlan-map (Gigabit Ethernet IQ and 10-Gigabit Ethernet with SFPP) . . . | 203 |
| | pop | 204 |
| | push | 205 |
| | swap | 206 |
| | vlan-id-list | 207 |
| Chapter 10 | Bridging and VLANs Monitoring Commands | 209 |
| | clear ethernet-switching table | 210 |
| | show ethernet-switching interfaces | 212 |
| | show ethernet-switching table | 216 |
| | show system statistics arp | 224 |
| | show vlans | 225 |
| Chapter 11 | MAC Address Operational Commands | 235 |
| | show ethernet-switching mac-learning-log | 236 |
| | show ethernet-switching mac-notification | 238 |
| | show ethernet-switching statistics aging | 240 |
| | show ethernet-switching statistics mac-learning | 242 |
| Chapter 12 | Spanning Tree Monitoring Commands | 247 |
| | clear error bpdu interface | 248 |
| | clear spanning-tree statistics | 249 |
| | show spanning-tree bridge | 250 |
| | show spanning-tree interface | 255 |
| | show spanning-tree mstp configuration | 261 |
| | show spanning-tree statistics | 263 |

List of Figures

| | | |
|------------------|---|-----------|
| Part 1 | Bridging and VLANs | |
| Chapter 1 | Using Bridging and VLANs | 3 |
| | Figure 1: IRB with One Switch | 20 |
| Part 3 | Spanning Trees | |
| Chapter 3 | Using Spanning Trees | 43 |
| | Figure 2: Network Topology for RSTP | 48 |
| | Figure 3: BPDU Protection Topology | 69 |

List of Tables

| | | |
|-------------------|---|-------------|
| | About the Documentation | xiii |
| | Table 1: Notice Icons | xv |
| | Table 2: Text and Syntax Conventions | xv |
| Part 1 | Bridging and VLANs | |
| Chapter 1 | Using Bridging and VLANs | 3 |
| | Table 3: Sample IRB Values | 19 |
| | Table 4: Number of Supported IRBs/RVIs by Platform | 19 |
| | Table 5: Components of the Multiple VLAN Topology | 21 |
| Part 3 | Spanning Trees | |
| Chapter 3 | Using Spanning Trees | 43 |
| | Table 6: Components of the Topology for Configuring RSTP | 48 |
| | Table 7: Components of the Topology for Configuring BPDU Protection on EX Series Switches | 69 |
| Part 6 | Configuration Statements and Operational Commands | |
| Chapter 6 | VLAN Configuration Statements | 105 |
| | Table 8: Unsupported [edit vlans] Configuration Statements on EX Series Switches | 108 |
| Chapter 10 | Bridging and VLANs Monitoring Commands | 209 |
| | Table 9: show ethernet-switching interfaces Output Fields | 212 |
| | Table 10: show ethernet-switching table Output Fields | 217 |
| | Table 11: show vlans Output Fields | 226 |
| Chapter 11 | MAC Address Operational Commands | 235 |
| | Table 12: show ethernet-switching mac-learning-log Output Fields | 236 |
| | Table 13: show ethernet-switching mac-notification Output Fields | 238 |
| | Table 14: show ethernet-switching statistics aging Output Fields | 240 |
| | Table 15: show ethernet-switching statistics mac-learning Output Fields | 243 |
| Chapter 12 | Spanning Tree Monitoring Commands | 247 |
| | Table 16: show spanning-tree bridge Output Fields | 250 |
| | Table 17: show spanning-tree Interface Output Fields | 256 |
| | Table 18: show spanning-tree mstp configuration Output Fields | 261 |
| | Table 19: show spanning-tree statistics Output Fields | 263 |

About the Documentation

- Documentation and Release Notes on page xiii
- Using the Examples in This Manual on page xiii
- Documentation Conventions on page xv
- Documentation Feedback on page xvii
- Requesting Technical Support on page xvii

Documentation and Release Notes

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

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

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

Using the Examples in This Manual

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

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

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

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

Documentation Conventions

Table 1 on page xv 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 xv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

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

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

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

Documentation Feedback

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

- Online feedback rating system—On any page of the Juniper Networks TechLibrary 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 <http://www.juniper.net/techpubs/feedback/>.
- E-mail—Send your comments to 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

Bridging and VLANs

- [Using Bridging and VLANs on page 3](#)

CHAPTER 1

Using Bridging and VLANs

- [Overview of Layer 2 Networking on page 3](#)
- [Understanding Layer 2 Broadcasting on page 5](#)
- [Layer 2 Learning and Forwarding for VLANs Overview on page 6](#)
- [Understanding Bridging and VLANs on page 7](#)
- [Configuring VLANs on page 14](#)
- [Configuring the Native VLAN Identifier \(CLI Procedure\) on page 16](#)
- [Creating a Series of Tagged VLANs on page 16](#)
- [Understanding Integrated Routing and Bridging on page 18](#)
- [Example: Configuring Routing Between VLANs on One Switch on page 20](#)
- [Configuring IRB Interfaces on page 25](#)
- [Adding a Static MAC Address Entry to the Ethernet Switching Table \(CLI Procedure\) on page 27](#)
- [Configuring Static ARP Entries on page 27](#)
- [Troubleshooting Ethernet Switching on page 28](#)

Overview of Layer 2 Networking

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

Layer 2, also known as the Data Link Layer, is the second level in the seven-layer OSI reference model for network protocol design. Layer 2 is equivalent to the link layer (the lowest layer) in the TCP/IP network model. Layer 2 is the network layer used to transfer data between adjacent network nodes in a wide area network or between nodes on the same local area network.

A *frame* is a protocol data unit, the smallest unit of bits on a Layer 2 network. Frames are transmitted to and received from devices on the same local area network (LAN). Unlike bits, frames have a defined structure and can be used for error detection, control plane activities and so forth. Not all frames carry user data. The network uses some frames to control the data link itself..

At Layer 2, *unicast* refers to sending frames from one node to a single other node, whereas *multicast* denotes sending traffic from one node to multiple nodes, and *broadcasting* refers to the transmission of frames to all nodes in a network. A *broadcast domain* is a

logical division of a network in which all nodes of that network can be reached at Layer 2 by a broadcast.

Segments of a LAN can be linked at the frame level using *bridges*. Bridging creates separate broadcast domains on the LAN, creating VLANs, which are independent logical networks that group together related devices into separate network segments. The grouping of devices on a VLAN is independent of where the devices are physically located in the LAN. Without bridging and VLANs, all devices on the Ethernet LAN are in a single broadcast domain, and all the devices detect all the packets on the LAN.

Forwarding is the relaying of packets from one network segment to another by nodes in the network. On a VLAN, a frame whose origin and destination are in the same VLAN are forwarded only within the local VLAN. A network segment is a portion of a computer network wherein every device communicates using the same physical layer.

Layer 2 contains two sublayers:

- Logical link control (LLC) sublayer, which is responsible for managing communications links and handling frame traffic.
- Media access control (MAC) sublayer, which governs protocol access to the physical network medium. By using the MAC addresses that are assigned to all ports on a switch, multiple devices on the same physical link can uniquely identify one another.

The ports, or interfaces, on a switch operate in either access mode, tagged-access, or trunk mode:

- *Access mode* ports connect to a network device such as a desktop computer, an IP telephone, a printer, a file server, or a security camera. The port itself belongs to a single VLAN. The frames transmitted over an access interface are normal Ethernet frames. By default, all ports on a switch are in access mode.
- *Tagged-Access mode* ports connect to a network device such as a desktop computer, an IP telephone, a printer, a file server, or a security camera. The port itself belongs to a single VLAN. The frames transmitted over an access interface are normal Ethernet frames. By default, all ports on a switch are in access mode. Tagged-access mode accommodates cloud computing, specifically scenarios including virtual machines or virtual computers. Because several virtual computers can be included on one physical server, the packets generated by one server can contain an aggregation of VLAN packets from different virtual machines on that server. To accommodate this situation, tagged-access mode reflects packets back to the physical server on the same downstream port when the destination address of the packet was learned on that downstream port. Packets are also reflected back to the physical server on the downstream port when the destination has not yet been learned. Therefore, the third interface mode, tagged access, has some characteristics of access mode and some characteristics of trunk mode:
- *Trunk mode* ports handle traffic for multiple VLANs, multiplexing the traffic for all those VLANs over the same physical connection. Trunk interfaces are generally used to interconnect switches to other devices or switches.

With native VLAN configured, frames that do not carry VLAN tags are sent over the trunk interface. If you have a situation where packets pass from a device to a switch

in access mode, and you want to then send those packets from the switch over a trunk port, use native VLAN mode. Configure the single VLAN on the switch's port (which is in access mode) as a native VLAN. The switch's trunk port will then treat those frames differently than the other tagged packets. For example, if a trunk port has three VLANs, 10, 20, and 30, assigned to it with VLAN 10 being the native VLAN, frames on VLAN 10 that leave the trunk port on the other end have no 802.1Q header (tag). There is another native VLAN option. You can have the switch add and remove tags for untagged packets. To do this, you first configure the single VLAN as a native VLAN on a port attached to a device on the edge. Then, assign a VLAN ID tag to the single native VLAN on the port connected to a device. Last, add the VLAN ID to the trunk port. Now, when the switch receives the untagged packet, it adds the ID you specified and sends and receives the tagged packets on the trunk port configured to accept that VLAN.

Including the sublayers, Layer 2 on the QFX Series supports the following functionality:

- Unicast, multicast, and broadcast traffic.
- Bridging.
- VLAN 802.1Q—Also known as *VLAN tagging*, this protocol allows multiple bridged networks to transparently share the same physical network link by adding VLAN tags to an Ethernet frame.
- Extension of Layer 2 VLANs across multiple switches using Spanning Tree Protocol (STP) prevents looping across the network.
- *MAC learning*, including per-VLAN MAC learning and Layer 2 learning suppression—This process obtains the MAC addresses of all the nodes on a network
- Link aggregation—This process groups of Ethernet interfaces at the physical layer to form a single link layer interface, also known as a *link aggregation group (LAG)* or LAG bundle
- Storm control on the physical port for unicast, multicast, and broadcast
- STP support, including 802.1d, RSTP, MSTP, and Root Guard

**Related
Documentation**

- [Understanding Bridging and VLANs on page 7](#)
- [Understanding Bridging and VLANs](#)

Understanding Layer 2 Broadcasting

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

In a Layer 2 network, *broadcasting* refers to sending traffic to all nodes on a network.

Layer 2 broadcast traffic stays within a local area network (LAN) boundary; known as the *broadcast domain*. Layer 2 broadcast traffic is sent to the broadcast domain using a MAC address of FF:FF:FF:FF:FF:FF. Every device in the broadcast domain recognizes this MAC address and passes the broadcast traffic on to other devices in the broadcast

domain, if applicable. Broadcasting can be compared to unicasting (sending traffic to a single node) or multicasting (delivering traffic to a group of nodes simultaneously).

Layer 3 broadcast traffic, however, is sent to all devices in a network using a broadcast network address. For example, if your network address is 192.0.0.0, the broadcast network address is 192.255.255.255. In this case, only devices that belong to the 192.0.0.0 network receive the Layer 3 broadcast traffic. Devices that do not belong to this network drop the traffic.

Broadcasting is used in the following situations:

- Address Resolution Protocol (ARP) uses broadcasting to map MAC addresses to IP addresses. ARP dynamically binds the IP address (the logical address) to the correct MAC address. Before IP unicast packets can be sent, ARP discovers the MAC address used by the Ethernet interface where the IP address is configured.
- Dynamic Host Configuration Protocol (DHCP) uses broadcasting to dynamically assign IP addresses to hosts on a network segment or subnet.
- Routing protocols use broadcasting to advertise routes.

Excessive broadcast traffic can sometimes create a broadcast storm. A broadcast storm occurs when messages are broadcast on a network and each message prompts a receiving node to respond by broadcasting its own messages on the network. This, in turn, prompts further responses that create a snowball effect. The LAN is suddenly flooded with packets, creating unnecessary traffic that leads to poor network performance or even a complete loss of network service.

Related Documentation

- [Overview of Layer 2 Networking on page 3](#)
- [Understanding Storm Control](#)
- [Understanding Bridging and VLANs](#)
- [Understanding Bridging and VLANs on page 7](#)

Layer 2 Learning and Forwarding for VLANs Overview

Supported Platforms [EX Series](#), [MX Series](#), [QFabric System](#), [QFX Series standalone switches](#)

When you configure a VLAN, Layer 2 address learning is enabled by default. The VLAN learns unicast media access control (MAC) addresses to avoid flooding the packets to all the ports in the VLAN. Each VLAN creates a source MAC entry in its source and destination MAC tables for each source MAC address learned from packets received on the ports that belong to the VLAN.



NOTE: Traffic is not flooded back onto the interface on which it was received. However, because this “split horizon” occurs at a late stage, the packet statistics displayed by commands such as `show interfaces queue` will include flood traffic.

You can optionally disable MAC learning either for the entire device or for a specific VLAN or logical interface. You can also configure the following Layer 2 learning and forwarding properties:

- Static MAC entries for logical interfaces only
- Limit to the number of MAC addresses learned from a specific logical interface or from all the logical interfaces in a VLAN
- Size of the MAC address table for the VLAN
- MAC accounting for a VLAN

**Related
Documentation**

- [Layer 2 Learning and Forwarding Overview](#)

Understanding Bridging and VLANs

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

Network switches use Layer 2 bridging protocols to discover the topology of their LAN and to forward traffic toward destinations on the LAN. This topic explains the following concepts regarding bridging and VLANs:

- [History of VLANs on page 7](#)
- [How Bridging of VLAN Traffic Works on page 8](#)
- [Packets Are Either Tagged or Untagged on page 9](#)
- [Switch Interface Modes—Access, Trunk, or Tagged Access on page 9](#)
- [Additional Advantages of Using VLANs on page 11](#)
- [Maximum VLANs and VLAN Members Per Switch on page 12](#)
- [A Default VLAN Is Configured on Most Switches on page 13](#)
- [Assigning Traffic to VLANs on page 13](#)
- [Forwarding VLAN Traffic on page 14](#)
- [VLANs Communicate with Integrated Routing and Bridging Interfaces or Routed VLAN Interfaces on page 14](#)

History of VLANs

Ethernet LANs were originally designed for small, simple networks that primarily carried text. However, over time, the type of data carried by LANs grew to include voice, graphics, and video. This more complex data, when combined with the ever-increasing speed of transmission, eventually became too much of a load for the original Ethernet LAN design. Multiple packet collisions were significantly slowing down the larger LANs.

The IEEE 802.1D-2004 standard helped evolve Ethernet LANs to cope with the higher data and transmission requirements by defining the concept of *transparent bridging* (generally called simply *bridging*). Bridging divides a single physical LAN (now called a single *broadcast domain*) into two or more virtual LANs, or VLANs. Each VLAN is a

collection of some of the LAN nodes grouped together to form individual broadcast domains.

When VLANs are grouped logically by function or organization, a significant percentage of data traffic stays within the VLAN. This relieves the load on the LAN because all traffic no longer has to be forwarded to all nodes on the LAN. A VLAN first transmits packets within the VLAN, thereby reducing the number of packets transmitted on the entire LAN. Because packets whose origin and destination are in the same VLAN are forwarded only within the local VLAN, packets that are not destined for the local VLAN are the only ones forwarded to other broadcast domains. This way, bridging and VLANs limit the amount of traffic flowing across the entire LAN by reducing the possible number of collisions and packet retransmissions within VLANs and on the LAN as a whole.

How Bridging of VLAN Traffic Works

Because the objective of the IEEE 802.1D-2004 standard was to reduce traffic and therefore reduce potential transmission collisions for Ethernet, a system was implemented to reuse information. Instead of having a switch go through a location process every time a frame is sent to a node, the transparent bridging protocol allows a switch to record the location of known nodes. When packets are sent to nodes, those destination node locations are stored in address-lookup tables called *Ethernet switching tables*. Before sending a packet, a switch using bridging first consults the switching tables to see if that node has already been located. If the location of a node is known, the frame is sent directly to that node.

Transparent bridging uses five mechanisms to create and maintain Ethernet switching tables on the switch:

- Learning
- Forwarding
- Flooding
- Filtering
- Aging

The key bridging mechanism used by LANs and VLANs is *learning*. When a switch is first connected to an Ethernet LAN or VLAN, it has no information about other nodes on the network. As packets are sent, the switch learns the embedded MAC addresses of the sending nodes and stores them in the Ethernet switching table, along with two other pieces of information—the interface (or port) on which the traffic was received on the destination node and the time the address was learned.

Learning allows switches to then do *forwarding*. By consulting the Ethernet switching table to see whether the table already contains the frame's destination MAC address, switches save time and resources when forwarding packets to the known MAC addresses. If the Ethernet switching table does not contain an entry for an address, the switch uses flooding to learn that address.

Flooding finds a particular destination MAC address without using the Ethernet switching table. When traffic originates on the switch and the Ethernet switching table does not

yet contain the destination MAC address, the switch first floods the traffic to all other interfaces within the VLAN. When the destination node receives the flooded traffic, it can send an acknowledgment packet back to the switch, allowing it to learn the MAC address of the node and add the address to its Ethernet switching table.

Filtering, the fourth bridging mechanism, is how broadcast traffic is limited to the local VLAN whenever possible. As the number of entries in the Ethernet switching table grows, the switch pieces together an increasingly complete picture of the VLAN and the larger LAN—it learns which nodes are in the local VLAN and which are on other network segments. The switch uses this information to filter traffic. Specifically, for traffic whose source and destination MAC addresses are in the local VLAN, filtering prevents the switch from forwarding this traffic to other network segments.

To keep entries in the Ethernet switching table current, the switch uses a fifth bridging mechanism, *aging*. Aging is the reason that the Ethernet switching table entries include timestamps. Each time the switch detects traffic from a MAC address, it updates the timestamp. A timer on the switch periodically checks the timestamp, and if it is older than a user-configured value, the switch removes the node's MAC address from the Ethernet switching table. This aging process eventually flushes unavailable network nodes out of the Ethernet switching table.

Packets Are Either Tagged or Untagged

When an Ethernet LAN is divided into VLANs, each VLAN is identified by a unique 802.1Q ID. The number of available VLANs and VLAN IDs are listed below:

- On a switch running ELS software, you can configure 4093 VLANs.
- On a switch running non-ELS software, you can configure 4091 VLANs.

Ethernet packets include a tag protocol identifier (TPID) EtherType field, which identifies the protocol being transported. When a device within a VLAN generates a packet, this field includes a value of 0x8100, which indicates that the packet is a VLAN-tagged packet. The packet also has a VLAN ID field that includes the unique 802.1Q ID, which identifies the VLAN to which the packet belongs.

Junos OS switches support the TPID value 0x9100 for Q-in-Q, and switches that run Junos OS that does not support the Enhanced Layer 2 Software (ELS) configuration style also support values of 0x88a8 (Provider Bridging and Shortest Path Bridging).

For a simple network that has only a single VLAN, all packets include a default 802.1Q tag, which is the only VLAN membership that does not mark the packet as tagged. These packets are untagged packets.

Switch Interface Modes—Access, Trunk, or Tagged Access

Ports, or interfaces, on a switch operate in one of three modes:

- Access mode
- Trunk mode
- Tagged-access mode

Access Mode

An interface in access mode connects a switch to a single network device, such as a desktop computer, an IP telephone, a printer, a file server, or a security camera. Access interfaces accept only untagged packets.

By default, when you boot a switch that runs Junos OS that does not support ELS and use the factory default configuration, or when you boot such a switch and do not explicitly configure a port mode, all interfaces on the switch are in access mode and accept only untagged packets from the VLAN named **default**. You can optionally configure another VLAN and use that VLAN instead of **default**.

On a switch that runs Junos OS that supports ELS, the VLAN named **default** is not supported. Therefore, on such switches, you must explicitly configure at least one VLAN, even if your network is simple and you want only one broadcast domain to exist. After you assign an interface to a VLAN, the interface functions in access mode.

For switches that run either type of software, you can also configure a trunk port or interface to accept untagged packets from a user-configured VLAN. For details about this concept (native VLAN), see [“Trunk Mode and Native VLAN” on page 10](#).

Trunk Mode

Trunk mode interfaces are generally used to connect switches to one another. Traffic sent between switches can then consist of packets from multiple VLANs, with those packets multiplexed so that they can be sent over the same physical connection. Trunk interfaces usually accept only tagged packets and use the VLAN ID tag to determine both the packets' VLAN origin and VLAN destination.

On a switch that runs software that does not support ELS, an untagged packet is not recognized on a trunk port unless you configure additional settings on that port.

On a switch that runs Junos OS that supports ELS, a trunk port recognizes untagged control packets for protocols such as the Link Aggregation Control Protocol (LACP) and the Link Layer Discovery Protocol (LLDP). However, the trunk port does not recognize untagged data packets unless you configure additional settings on that port.

In the rare case where you want untagged packets to be recognized by a trunk port on switches that run either type of software, you must configure the single VLAN on a trunk port as a *native VLAN*. For more information about native VLANs, see [“Trunk Mode and Native VLAN” on page 10](#).

Trunk Mode and Native VLAN

On a switch that runs Junos OS that does not support ELS, a trunk port does not recognize packets that do not include VLAN tags, which are also known as untagged packets. On a switch that runs Junos OS that supports ELS, a trunk port recognizes untagged control packets, but it does not recognize untagged data packets. With native VLAN configured, untagged packets that a trunk port normally does not recognize are sent over the trunk interface. In a situation where packets pass from a device, such as an IP phone or printer, to a switch in access mode, and you want those packets sent from the switch over a

trunk port, use native VLAN mode. Create a native VLAN by configuring a VLAN ID for it, and specify that the trunk port is a member of the native VLAN.

The switch's trunk port will then treat those packets differently than the other tagged packets. For example, if a trunk port has three VLANs, 10, 20, and 30, assigned to it with VLAN 10 being the native VLAN, packets on VLAN 10 that leave the trunk port on the other end have no 802.1Q header (tag).

There is another native VLAN option for switches that do not support ELS. You can have the switch add and remove tags for untagged packets. To do this, you first configure the single VLAN as a native VLAN on a port attached to a device on the edge. Then, assign a VLAN ID tag to the single native VLAN on the port connected to a device. Last, add the VLAN ID to the trunk port. Now, when the switch receives the untagged packet, it adds the ID you specified and sends and receives the tagged packets on the trunk port configured to accept that VLAN.

Tagged-Access Mode

Only switches that run Junos OS that does not use the ELS configuration style support tagged-access mode. Tagged-access mode accommodates cloud computing, specifically scenarios including virtual machines or virtual computers. Because several virtual computers can be included on one physical server, the packets generated by one server can contain an aggregation of VLAN packets from different virtual machines on that server. To accommodate this situation, tagged-access mode reflects packets back to the physical server on the same downstream port when the destination address of the packet was learned on that downstream port. Packets are also reflected back to the physical server on the downstream port when the destination has not yet been learned. Therefore, the third interface mode, tagged access, has some characteristics of access mode and some characteristics of trunk mode:

- Like access mode, tagged-access mode connects the switch to an access layer device. Unlike access mode, tagged-access mode is capable of accepting VLAN tagged packets.
- Like trunk mode, tagged-access mode accepts VLAN tagged packets from multiple VLANs. Unlike trunk port interfaces, which are connected at the core/distribution layer, tagged-access port interfaces connect devices at the access layer.

Like trunk mode, tagged-access mode also supports native VLAN.



NOTE: Control packets are never reflected back on the downstream port.

Additional Advantages of Using VLANs

In addition to reducing traffic and thereby speeding up the network, VLANs have the following advantages:

- VLANs provide segmentation services traditionally provided by routers in LAN configurations, thereby reducing hardware equipment costs.
- Packets coupled to a VLAN can be reliably identified and sorted into different domains. You can contain broadcasts within parts of the network, thereby freeing up network

resources. For example, when a DHCP server is plugged into a switch and starts broadcasting its presence, you can prevent some hosts from accessing it by using VLANs to split up the network.

- For security issues, VLANs provide granular control of the network because each VLAN is identified by a single IP subnetwork. All packets passing in and out of a VLAN are consistently tagged with the VLAN ID of that VLAN, thereby providing easy identification, because a VLAN ID on a packet cannot be altered. (For a switch that runs Junos OS that does not support ELS, we recommend that you avoid using 1 as a VLAN ID, because that ID is a default value.)
- VLANs react quickly to host relocation—this is also due to the persistent VLAN tag on packets.
- On an Ethernet LAN, all network nodes must be physically connected to the same network. In VLANs, the physical location of nodes is not important—you can group network devices in any way that makes sense for your organization, such as by department or business function, types of network nodes, or physical location.

Maximum VLANs and VLAN Members Per Switch

The number of VLANs supported per switch varies for each switch. Use the configuration-mode command **set vlans *vlan-name* *vlan-id* ?** to determine the maximum number of VLANs allowed on a switch. You cannot exceed this VLAN limit because you have to assign a specific ID number when you create a VLAN—you could overwrite one of the numbers, but you cannot exceed the limit.

You can, however, exceed the recommended VLAN member maximum for a switch.

On a switch that runs Junos OS that does not support the ELS configuration style, the maximum number of VLAN members allowed on the switch is eight times the maximum number of VLANs that the switch supports ($\text{vmember limit} = \text{vlan max} * 8$). If the configuration of the switch exceeds the recommended VLAN member maximum, a warning message appears when you commit the configuration. If you commit the configuration despite the warning, the commit succeeds, but there is a risk of the Ethernet switching process (eswd) failing as a result of memory allocation failure.

On a switch that runs Junos OS that supports ELS, the maximum number of VLAN members allowed on the switch is 24 times the maximum number of VLANs that the switch supports ($\text{vmember limit} = \text{vlan max} * 24$). If the configuration of the switch exceeds the recommended VLAN member maximum, a warning message appears in the system log (syslog).

A QFabric system supports up to 131,008 VLAN members (vmembers) on a single network node group, server node group, or redundant server node group. The number of vmembers is calculated by multiplying the maximum number of VLANs by 32.

For example, to calculate how many interfaces are required to support 4,000 VLANs, divide the maximum number of vmembers (128,000) by the number of configured VLANs (4,000). In this case, 32 interfaces are required.

On network Node groups and server Node groups, you can configure link aggregation groups (LAGs) across multiple interfaces. Each LAG and VLAN combination is considered a vmember.

A Virtual Chassis Fabric supports up to 512,000 vmembers. The number of vmembers is based on the number of VLANs, and the number of interfaces configured in each VLAN.

A Default VLAN Is Configured on Most Switches

Some switches that run Junos OS that do not support the ELS configuration style are preconfigured with a VLAN named **default** that does not tag packets and operates only with untagged packets. On these switches, each interface already belongs to the VLAN named **default** and all traffic uses this VLAN until you configure more VLANs and assign traffic to those VLANs.



NOTE: When a Juniper Networks QFX3500 or QFX3600 switch is interconnected with other switches in a Virtual Chassis configuration, each individual switch that is included as a member of the configuration is identified with a member ID. The member ID functions as an FPC slot number. When you are configuring interfaces for a Virtual Chassis configuration, you specify the appropriate member ID (0 through 9) as the slot element of the interface name. The default factory settings for a Virtual Chassis configuration include FPC 0 as a member of the default VLAN because FPC 0 is configured as part of the ethernet-switching family. In order to include FPC 1 through FPC 9 in the default VLAN, add the ethernet-switching family to the configurations for those interfaces.

Assigning Traffic to VLANs

You can assign traffic on any switch to a particular VLAN by referencing either the interface port of the traffic or the MAC addresses of devices sending traffic.



NOTE: Two logical interfaces that are configured on the same physical interface cannot be mapped to the same VLAN.

Assign VLAN Traffic According to the Interface Port Source

This method is most commonly used to assign traffic to VLANs. In this case, you specify that all traffic received on a particular switch interface is assigned to a specific VLAN. You configure this VLAN assignment when you configure the switch, by using either the VLAN number (called a VLAN ID) or by using the VLAN name, which the switch then translates into a numeric VLAN ID. This method is referred to simply as creating a VLAN because it is the most commonly used method.

Assign VLAN Traffic According to the Source MAC Address

In this case, all traffic received from a specific MAC address is forwarded to a specific egress interface (next hop) on the switch. MAC-based VLANs are either static (named MAC addresses configured one at a time) or dynamic (configured using a RADIUS server).

To configure a static MAC-based VLAN on a switch that supports ELS, see *Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)*. To configure a static MAC-based VLAN on a switch that does not support ELS, see *Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)*.

Forwarding VLAN Traffic

To pass traffic within a VLAN, the switch uses Layer 2 forwarding protocols, including IEEE 802.1Q spanning-tree protocols.

To pass traffic between two VLANs, the switch uses standard Layer 3 routing protocols, such as static routing, OSPF, and RIP. The same interfaces that support Layer 2 bridging protocols also support Layer 3 routing protocols, providing multilayer switching.

To pass traffic from a single device on an access port to a switch and then pass those packets on a trunk port, use the native mode configuration previously discussed under [“Trunk Mode” on page 10](#).

VLANs Communicate with Integrated Routing and Bridging Interfaces or Routed VLAN Interfaces

Traditionally, switches sent traffic to hosts that were part of the same broadcast domain (VLAN) but routers were needed to route traffic from one broadcast domain to another. Also, only routers performed other Layer 3 functions such as traffic engineering.

Switches that run Junos OS that supports the ELS configuration style perform inter-VLAN routing functions using an integrated routing and bridging (IRB) interface named `irb`, while switches that run Junos OS that does not support ELS perform these functions using a routed VLAN interface (RVI) named `vlan`. These interfaces detect both MAC addresses and IP addresses and route data to Layer 3 interfaces, thereby frequently eliminating the need to have both a switch and a router.

Related Documentation

- [Example: Setting Up Basic Bridging and a VLAN on the QFX Series](#)
- [Example: Setting Up Bridging with Multiple VLANs](#)
- [Understanding FCoE](#)
- [Interfaces Overview](#)

Configuring VLANs

Supported Platforms [EX4600, QFX Series standalone switches](#)

Switches use VLANs to make logical groupings of network nodes with their own broadcast domains. You can use VLANs to limit the traffic flowing across the entire LAN and reduce collisions and packet retransmissions.



NOTE: This task supports the Enhanced Layer 2 Software (ELS) configuration style. For ELS details, see *Getting Started with Enhanced Layer 2 Software*. If your switch runs software that does not support ELS, see *Configuring VLANs*.



NOTE: Two logical interfaces that are configured on the same physical interface cannot be mapped to the same VLAN.

For each endpoint on the VLAN, configure the following VLAN parameters on the corresponding interface:

1. Specify the description of the VLAN:

```
[edit interfaces interface-name unit 0]
user@switch# set description vlan-description
```

2. Specify the unique name of the VLAN:



NOTE: Switches that run Junos OS with the ELS configuration style do not support a default VLAN. Therefore, on such switches, you must explicitly configure at least one VLAN, even if your network is simple and you want only one broadcast domain to exist.

```
[edit interfaces interface-name unit 0]
user@switch# set family ethernet-switching vlan members vlan-name
```

3. Create the subnet for the VLAN:

```
[edit interfaces]
user@switch# set vlan unit 0 family inet address ip-address
```

4. Configure the VLAN tag ID or VLAN ID list for the VLAN:

```
[edit vlans]
user@switch# set vlan-name vlan-id vlan-id-number
```

or

```
[edit vlans]
user@switch# set vlan-name vlan-id-list [vlan-ids | vlan-id--vlan-id-]
```

5. Specify a VLAN firewall filter to be applied to incoming or outgoing packets:

```
[edit vlans]
user@switch# set vlan-name filter (input | output) filter-name
```

Related Documentation

- [Example: Setting Up Basic Bridging and a VLAN on the QFX Series](#)
- [Configuring IRB Interfaces on page 25](#)
- [Creating a Series of Tagged VLANs](#)
- [Understanding Bridging and VLANs on page 7](#)

Configuring the Native VLAN Identifier (CLI Procedure)

Supported Platforms EX Series, QFX Series standalone switches



NOTE: This task uses Junos OS for EX Series switches and Junos OS for QFX3500 and QFX3600 switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Configuring the Native VLAN Identifier (CLI Procedure)*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

Switches can receive and forward routed or bridged Ethernet frames with 802.1Q VLAN tags. Typically, trunk ports, which connect switches to each other, accept untagged control packets but do not accept untagged data packets. You can enable a trunk port to accept untagged data packets by configuring a native VLAN ID on the interface on which you want the untagged data packets to be received. The logical interface on which untagged packets are to be received must be configured with the same VLAN ID as the native VLAN ID configured on the physical interface.

To configure the native VLAN ID by using the command-line interface (CLI):

1. On the interface on which you want untagged data packets to be received, set the interface mode to **trunk**, which specifies that the interface is in multiple VLANs and can multiplex traffic between different VLANs.:

```
[edit interfaces]
user@switch# set interface-name unit logical-unit-number family
ethernet-switching interface-mode trunk
```

2. Configure the native VLAN ID:

```
[edit interfaces]
user@switch# set interface-name native-vlan-id vlan-id
```

3. Specify that the logical interface that will receive the untagged data packets is a member of the native VLAN:

```
[edit interfaces]
user@switch# set interface-name unit logical-unit-number family
ethernet-switching vlan members vlan-id
```

Related Documentation

- *Understanding Bridging and VLANs on EX Series Switches*
- *Example: Connecting Access Switches to a Distribution Switch*
- *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*
- *Example: Setting Up Basic Bridging and a VLAN on the QFX Series*

Creating a Series of Tagged VLANs

Supported Platforms EX4600, QFX Series standalone switches

When you divide an Ethernet LAN into multiple VLANs, each VLAN is assigned a unique IEEE 802.1Q tag. This tag is associated with each frame in the VLAN, and the network nodes receiving the traffic can use the tag to identify which VLAN a frame is associated with.

Instead of configuring VLANs and 802.1Q tags one at a time for a trunk interface, you can configure a VLAN range to create a series of tagged VLANs.

When an Ethernet LAN is divided into VLANs, each VLAN is identified by a unique 802.1Q tag. The tag is applied to all frames so that the network nodes receiving the frames can detect which VLAN the frames belong to. Trunk ports, which multiplex traffic among a number of VLANs, use the tag to determine the origin of frames and where to forward them.

For example, you could configure the VLAN **employee** and specify a tag range of **10 through 12**. This creates the following VLANs and tags:

- VLAN **employee-10**, tag 10
- VLAN **employee-11**, tag 11
- VLAN **employee-12**, tag 12

Creating tagged VLANs in a series has the following limitations:

- Layer 3 interfaces do not support this feature.
- Because an access interface can only support one VLAN member, access interfaces also do not support this feature.



NOTE: This task uses Junos OS for Junos OS for QFX3500 and QFX3600 switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Creating a Series of Tagged VLANs*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

To configure a series of tagged VLANs using the CLI (here, the VLAN is **employee**):

1. Configure the series (here, a VLAN series from 120 through 130):

```
[edit]
user@switch# set vlans employee vlan-id-list [ 120-130 ]
```

2. Associate a series of tagged VLANs when you configure an interface in one of two ways:

- Include the name of the series:

```
[edit interfaces]
user@switch# set interfaces xe-0/0/22.0 family ethernet-switching vlanmembers employee
```

- Include the VLAN range:

```
[edit interfaces]
user@switch# set interfaces xe-0/0/22.0 family ethernet-switching vlan members 120-130
```

Associating a series of tagged VLANs to an interface by name or by VLAN range the same result: VLANs **__employee_120__** through **__employee_130__** are created.



NOTE: When a series of VLANs is created using the `vlan-id-list` command, the VLAN names are preceded and followed by a double underscore.

Related Documentation

- [Example: Setting Up Bridging with Multiple VLANs](#)
- [Understanding Bridging and VLANs on page 7](#)

Understanding Integrated Routing and Bridging

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

To segment traffic on a LAN into separate broadcast domains, you create separate virtual LANs (VLANs). VLANs limit the amount of traffic flowing across the entire LAN, reducing the possible number of collisions and packet retransmissions within the LAN. For example, you might want to create a VLAN that includes the employees in a department and the resources that they use often, such as printers, servers, and so on.

Of course, you also want to allow these employees to communicate with people and resources in other VLANs. To forward packets between VLANs, you normally you need a router that connects the VLANs. However, you can accomplish this forwarding on a switch without using a router by configuring an integrated routing and bridging (IRB) interface. (These interfaces are also called routed VLAN interfaces, or RVIs). Using this approach reduces complexity and avoids the costs associated with purchasing, installing, managing, powering, and cooling another device.

An IRB is a special type of Layer 3 virtual interface named **vlan**. Like normal Layer 3 interfaces, the **vlan** interface needs a logical unit number with an IP address. In fact, to be useful an IRB needs at least two logical units and two IP addresses—you must create units with addresses in each of the subnets associated with the VLANs between which you want traffic to be routed. That is, if you have two VLANs (for example, VLAN **red** and

VLAN **blue**) with corresponding subnets, your IRB must have a logical unit with an address in the subnet for **red** and a logical unit with an address in the subnet for **blue**. The switch automatically creates direct routes to these subnets and uses these routes to forward traffic between VLANs.



NOTE: If you are using a version of Junos OS that supports Enhanced Layer 2 Software (ELS), you can also create a Layer 3 virtual interface named **irb** instead of **vlan**—that is, both statements are supported by ELS

Table 3 on page 19 shows values you might use when configuring an IRB:

Table 3: Sample IRB Values

| Property | Settings |
|-------------------------------|---|
| VLAN names and tags (IDs) | blue , ID 100 red , ID 200 |
| Subnets associated with VLANs | blue : 192.0.2.0/25 (addresses 192.0.2.1 through 192.0.2.126) red : 192.0.2.128/25 (addresses 192.0.2.129 through 192.0.2.254) |
| IRB name | interface irb |
| IRB units and addresses | logical unit 100: 192.0.2.1/25 logical unit 200: 192.0.2.129/25 |

For the sake of consistency and to avoid confusion, Table 3 on page 19 shows IRB logical unit numbers that match the IDs of the corresponding VLANs. However, you do not have to assign logical unit numbers that match the VLAN IDs—you can use any values for the units. To bind the logical units of the IRB to the appropriate VLANs, you use the **l3-interface** statement.

Because IRBs operate at Layer 3, you can use Layer 3 services such as firewall filters or CoS rewriting with them.

Table 4 on page 19 shows the number of IRBs/RVIs that each QFX platform supports.

Table 4: Number of Supported IRBs/RVIs by Platform

| Platform | Number of Supported IRBs/RVIs |
|-----------|-------------------------------|
| QFX3500 | 1200 |
| QFX3000-G | 1024 |
| QFX3000-M | 1024 |

Related Documentation • [Example: Configuring Routing Between VLANs on One Switch on page 20](#)

Example: Configuring Routing Between VLANs on One Switch

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

To segment traffic on a LAN into separate broadcast domains, you create separate virtual LANs (VLANs). For example, you might want to create a VLAN that includes the employees in a department and the resources that they use often, such as printers, servers, and so on.

Of course, you also want to allow these employees to communicate with people and resources in other VLANs. To forward packets between VLANs you normally you need a router that connects the VLANs. However, you can accomplish this on a Juniper Networks switch without using a router by configuring an integrated routing and bridging (IRB) interface (also known as a routed VLAN interface—or RVI—in versions of Junos OS that do not support Enhanced Layer 2 Software). Using this approach reduces complexity and avoids the costs associated with purchasing, installing, managing, powering, and cooling another device.

- [Requirements on page 20](#)
- [Overview and Topology on page 20](#)
- [Configure Layer 2 switching for two VLANs on page 21](#)
- [Verification on page 24](#)

Requirements

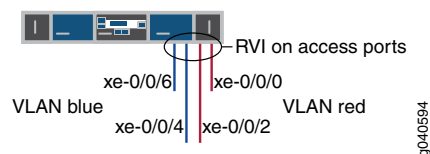
This example uses the following hardware and software components:

- One switch
- Junos OS Release 11.1 or later

Overview and Topology

This example uses an IRB to route traffic between two VLANs on the same switch. The topology is shown in [Figure 1 on page 20](#).

Figure 1: IRB with One Switch



This example shows a simple configuration to illustrate the basic steps for creating two VLANs on a single switch and configuring an IRB to enable routing between the VLANs. One VLAN, called **blue**, is for the sales and marketing group, and a second, called **red**, is for the customer support team. The sales and support groups each have their own file servers and wireless access points. Each VLAN must have a unique name, tag (VLAN ID), and distinct IP subnet. [Table 5 on page 21](#) lists the components of the sample topology.

Table 5: Components of the Multiple VLAN Topology

| Property | Settings |
|--------------------------------|---|
| VLAN names and tag IDs | blue , ID 100 red , ID 200 |
| Subnets associated with VLANs | blue : 192.0.2.0/25 (addresses 192.0.2.1 through 192.0.2.126) red : 192.0.2.128/25 (addresses 192.0.2.129 through 192.0.2.254) |
| Interfaces in VLAN blue | Sales server port: xe-0/0/4 Sales wireless access points: xe-0/0/6 |
| Interfaces in VLAN red | Support server port: xe-0/0/0 Support wireless access points: xe-0/0/2 |
| IRB name | interface irb |
| IRB units and addresses | logical unit 100: 192.0.2.1/25 logical unit 200: 192.0.2.129/25 |

This configuration example creates two IP subnets, one for the blue VLAN and the second for the red VLAN. The switch bridges traffic within the VLANs. For traffic passing between two VLANs, the switch routes the traffic using an IRB on which you have configured addresses in each IP subnet.

To keep the example simple, the configuration steps show only a few interfaces and VLANs. Use the same configuration procedure to add more interfaces and VLANs. By default, all interfaces are in access mode, so you do not have to configure the port mode.

Configure Layer 2 switching for two VLANs

CLI Quick Configuration To quickly configure Layer 2 switching for the two VLANs (**blue** and **red**) and to quickly configure Layer 3 routing of traffic between the two VLANs, copy the following commands and paste them into the switch terminal window:



NOTE: The following example uses a version of Junos OS that supports Enhanced Layer 2 Software (ELS). When you use ELS, you create a Layer 3 virtual interface named **irb**. If you are using a version of Junos OS that does not support ELS, you create a Layer 3 virtual interface named **vlan**.

```
[edit]
set interfaces xe-0/0/4 unit 0 description "Sales server port"
set interfaces xe-0/0/4 unit 0 family ethernet-switching vlan members blue
set interfaces xe-0/0/6 unit 0 description "Sales wireless access point port"
set interfaces xe-0/0/6 unit 0 family ethernet-switching vlan members blue
set interfaces xe-0/0/0 unit 0 description "Support servers"
set interfaces xe-0/0/0 unit 0 family ethernet-switching vlan members red
set interfaces xe-0/0/2 unit 0 description "Support wireless access point port"
set interfaces xe-0/0/2 unit 0 family ethernet-switching vlan members red
set interfaces irb unit 100 family inet address 192.0.2.1/25
```

```
set interfaces irb unit 200 family inet address 192.0.2.129/25
set vlans blue l3-interface irb.100
set vlans blue vlan-id 100
set vlans red vlan-id 200
set vlans red l3-interface irb.200
```

**Step-by-Step
Procedure**

To configure the switch interfaces and the VLANs to which they belong:

1. Configure the interface for the sales server in the blue VLAN:

```
[edit interfaces xe-0/0/4 unit 0]
user@switch# set description "Sales server port"
user@switch# set family ethernet-switching vlan members blue
```

2. Configure the interface for the wireless access point in the blue VLAN:

```
[edit interfaces xe-0/0/6 unit 0]
user@switch# set description "Sales wireless access point port"
user@switch# set family ethernet-switching vlan members blue
```

3. Configure the interface for the support server in the red VLAN:

```
[edit interfaces xe-0/0/0 unit 0]
user@switch# set description "Support server port"
user@switch# set family ethernet-switching vlan members red
```

4. Configure the interface for the wireless access point in the red VLAN:

```
[edit interfaces xe-0/0/2 unit 0]
user@switch# set description "Support wireless access point port"
user@switch# set family ethernet-switching vlan members red
```

**Step-by-Step
Procedure**

Now create the VLANs and the IRB. The IRB will have logical units in the broadcast domains of both VLANs.

1. Create the red and blue VLANs by configuring the VLAN IDs for them:

```
[edit vlans]
user@switch# set blue vlan-id 100
user@switch# set red vlan-id 200
```

2. Create the interface named **irb** with a logical unit in the sales broadcast domain (blue VLAN):

```
[edit interfaces]
user@switch# set irb unit 100 family inet address 192.0.2.1/25
```

The unit number is arbitrary and does not have to match the VLAN tag ID. However, configuring the unit number to match the VLAN ID can help avoid confusion.

3. Add a logical unit in the support broadcast domain (red VLAN) to the **irb** interface:

```
[edit interfaces]
user@switch# set irb unit 200 family inet address 192.0.2.129/25
```

4. Complete the IRB configuration by binding the red and blue VLANs (Layer 2) with the appropriate logical units of the **irb** interface (Layer 3):

```
[edit vlans]
user@switch# set blue l3-interface irb.100
user@switch# set red l3-interface irb.200
```

Configuration Results

Display the results of the configuration:

```
user@switch> show configuration
interfaces {
```



```
xe-0/0/4 {
  unit 0 {
    description "Sales server port";
    family ethernet-switching {
      vlan members blue;
    }
  }
}
xe-0/0/6 {
  unit 0 {
    description "Sales wireless access point port";
    family ethernet-switching {
      vlan members blue;
    }
  }
}
xe-0/0/0 {
  unit 0 {
    description "Support server port";
    family ethernet-switching {
      vlan members red;
    }
  }
}
xe-0/0/2 {
  unit 0 {
    description "Support wireless access point port";
    family ethernet-switching {
      vlan members red;
    }
  }
}
irb {
  unit 100 {
    family inet address 192.0.2.1/25;
  }
  unit 200 {
    family inet address 192.0.2.129/25;
  }
}
}
vlands {
  blue {
    vlan-id 100;
    interface xe-0/0/4.0;
    interface xe-0/0/6.0;
    l3-interface irb 100;
  }
  red {
    vlan-id 200;
    interface xe-0/0/0.0;
    interface xe-0/0/2.0;
    l3-interface irb 200;
  }
}
```



TIP: To quickly configure the blue and red VLAN interfaces, issue the `load merge terminal` command, copy the hierarchy, and paste it into the switch terminal window.

Verification

To verify that the **blue** and **red** VLANs have been created and are operating properly, perform these tasks:

- [Verifying That the VLANs Have Been Created and Associated with the Correct Interfaces on page 24](#)
- [Verifying That Traffic Can Be Routed Between the Two VLANs on page 24](#)

Verifying That the VLANs Have Been Created and Associated with the Correct Interfaces

Purpose Verify that the VLANs **blue** and **red** have been created on the switch and that all connected interfaces on the switch are members of the correct VLAN.

Action List all VLANs configured on the switch:

```
user@switch> show vlans
Name      Tag      Interfaces
default   100      xe-0/0/0.0, xe-0/0/2.0, xe-0/0/4.0, xe-0/0/6.0,
blue      100      xe-0/0/4.0, xe-0/0/6.0,
red       200      xe-0/0/0.0, xe-0/0/2.0, *
mgmt      me0.0*
```

Meaning The `show vlans` command lists all VLANs configured on the switch and which interfaces are members of each VLAN. This command output shows that the **blue** and **red** VLANs have been created. The **blue** VLAN has a tag ID of 100 and is associated with interfaces **xe-0/0/4.0** and **xe-0/0/6.0**. VLAN **red** has a tag ID of 200 and is associated with interfaces **xe-0/0/0.0** and **xe-0/0/2.0**.

Verifying That Traffic Can Be Routed Between the Two VLANs

Purpose Verify routing between the two VLANs.

Action Verify that the IRB logical units are up:

```
user@switch> show interfaces terse
irb.100      up    up    inet    192.0.2.1/25
irb.200      up    up    inet    192.0.2.129/25
```



NOTE: At least one port (access or trunk) with an appropriate VLAN assigned to it must be up for the irb interface to be up.

Verify that switch has created routes that use the IRB logical units:

```
user@switch> show route
192.0.2.0/25      *[Direct/0] 1d 03:26:45
                  > via irb.100
192.0.2.1/32     *[Local/0] 1d 03:26:45
                  Local via irb.100
192.0.2.128/25   *[Direct/0] 1d 03:26:45
                  > via irb.200
192.0.2.129/32   *[Local/0] 1d 03:26:45
                  Local via irb.200
```

List the Layer 3 routes in the switch's Address Resolution Protocol (ARP) table:

```
user@switch> show arp
```

| MAC Address | Address | Name | Flags |
|-------------------|-------------|---------|-------|
| 00:00:0c:06:2c:0d | 192.0.2.7 | irb.100 | None |
| 00:13:e2:50:62:e0 | 192.0.2.132 | irb.200 | None |

Meaning The output of the **show interfaces** and **show route** commands show that the Layer 3 IRB logical units are working and the switch has used them to create direct routes that it will use to forward traffic between the VLAN subnets. The **show arp** command displays the mappings between the IP addresses and MAC addresses for devices on both **irb.100** (associated with VLAN **blue**) and **irb.200** (associated with VLAN **red**). These two devices can communicate.

Related Documentation

- [Understanding Integrated Routing and Bridging on page 18](#)
- [irb \(Interfaces\) on page 126](#)
- [l3-interface on page 129](#)

Configuring IRB Interfaces

Supported Platforms EX4600, QFabric System, QFX Series standalone switches

Integrated routing and bridging (IRB) interfaces enable a switch to recognize which packets are being sent to local addresses so that they are bridged whenever possible and are routed only when needed. Whenever packets can be switched instead of routed, several layers of processing are eliminated. Switching also reduces the number of address look-ups.



NOTE: In versions of Junos OS that do not support Enhanced Layer 2 Software (ELS), this type of interface is called a routed VLAN interface (RVI).

To configure the routed VLAN interface:

1. Create the VLAN by assigning it a name and a VLAN ID:

```
[edit]
user@switch# set vlans support vlan-id 111
```

2. Assign an interface to the VLAN by specifying the logical interface (with the **unit** statement) and specifying the VLAN name as the member:

```
[edit]
user@switch# set interfaces ge-0/0/18 unit 0 family ethernet-switching vlan members
support
```

3. Create the subnet for the VLAN's broadcast domain:

```
[edit]
user@switch# set interfaces irb unit 111 family inet address 111.111.111.1/24
```

4. Bind a Layer 3 interface with the VLAN:

```
[edit]
user@switch# set vlans support l3-interface irb.111
```



NOTE: If you are using a version of Junos OS that does not support ELS, you create a Layer 3 virtual interface named **vlan**



NOTE: Layer 3 interfaces on trunk ports allow the interface to transfer traffic between multiple VLANs. Within a VLAN, traffic is bridged, while across VLANs, traffic is routed.

You can display the configuration settings:

```
user@switch> show interfaces irb terse
Interface      Admin Link Proto  Local          Remote
vlan           up    up
irb.111        up    up  inet   111.111.111.1/24
```

```
user@switch> show vlans
Name      Tag  Interfaces
default
employee-vlan  20
marketing    40
            ge-1/0/0.0, ge-1/0/1.0, ge-1/0/2.0
```

```

support      111      ge-1/0/10.0, ge-1/0/20.0, ge-1/0/30.0
              ge-0/0/18.0
mgmt          bme0.32769, bme0.32771*

user@switch> show ethernet-switching table
Ethernet-switching table: 1 entries, 0 learned
  VLAN      MAC address      Type      Age      Interfaces
  support    00:19:e2:50:95:a0 Static      - Router

```

Related Documentation

- [Understanding Integrated Routing and Bridging on page 18](#)

Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)

Supported Platforms [EX Series, QFX Series standalone switches](#)



NOTE: This task uses Junos OS for EX Series switches and Junos OS for QFX3500 and QFX3600 switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

The Ethernet switching table, also known as the forwarding table, specifies the known locations of VLAN nodes and the addresses of devices within those nodes. There are two ways to populate the Ethernet switching table on a switch. The easiest method is to let the switch update the table with MAC addresses.

The second way to populate the Ethernet switching table is to manually insert addresses into the table. You can do this to reduce flooding and speed up the switch's automatic learning process.

Before configuring a static MAC address, be sure that you have:

- Set up the VLAN. See *Configuring VLANs for EX Series Switches (CLI Procedure)*.

To configure an interface to have a static MAC address:

```

[edit vlans vlan-name switch-options interface interface-name]
user@switch# set static-mac mac-address

```

Related Documentation

- [Understanding Bridging and VLANs on EX Series Switches](#)

Configuring Static ARP Entries

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

You can create static ARP table entries, which are explicit mappings between IP addresses and MAC addresses.

- To configure a static ARP entry:

```
[edit interfaces interface-name unit logical-unit-number family inet address  
address]  
user@switch# set arp ip-address (mac | multicast-mac) mac-address
```

The IP address that you specify must be part of the subnet defined in the enclosing **address** statement.

To associate a multicast MAC address with a unicast IP address, use the **multicast-mac** statement.

Specify the MAC address as 6 hexadecimal bytes in one of the following formats:
nnnn.nnnn.nnnn or *nn:nn:nn:nn:nn:nn*; for example, 0011.2233.4455 or 00:11:22:33:44:55.

**Related
Documentation**

- *Understanding Static ARP Entries*
- *arp*

Troubleshooting Ethernet Switching

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

Problem **Description:** Sometimes a MAC address entry in the switch's Ethernet switching table is not updated after the device with that MAC address has been moved from one interface to another on the switch. Typically, the switch does not wait for a MAC address expiration when a MAC move operation occurs. As soon as the switch detects the MAC address on the new interface, it immediately updates the table. Many network devices send a gratuitous ARP packet when switching an IP address from one device to another. The switch updates its ARP cache table after receipt of such gratuitous ARP messages, and then it also updates its Ethernet switching table.

Sometimes silent devices, such as syslog servers or SNMP trap receivers that receive UDP traffic but do not return acknowledgment (ACK) messages to the traffic source, fail to send gratuitous ARP packets when a device moves. If such a move occurs when the system administrator is not available to explicitly clear the affected interfaces by issuing the **clear ethernet-switching table** command, the entry for the moved device in the Ethernet switching table is not updated.

Solution Set up the switch to handle unattended MAC address switchovers.

1. Reduce the system-wide ARP aging timer. (By default, the ARP aging timer is set at 20 minutes. The range of the ARP aging timer is from 1 through 240 minutes.)

```
[edit system arp]  
user@switch# set aging-timer 3
```

2. Set the MAC aging timer to the same value as the ARP timer. (By default, the MAC aging timer is set to 300 seconds. The range is 60 to 1,000,000 seconds.)

```
[edit protocols 12-learning]  
user@switch# set global-mac-table-aging-time 180
```

The ARP entry and the MAC address entry for the moved device expire within the times specified by the aging timer values. After the entries expire, the switch sends a new ARP message to the IP address of the device. The device responds to the ARP message,

thereby refreshing the entries in the switch's ARP cache table and Ethernet switching table.

- Related Documentation**
- *arp*
 - [global-mac-table-aging-time on page 149](#)

PART 2

MAC Addresses

- [Using MAC Addresses on page 33](#)

CHAPTER 2

Using MAC Addresses

- [Introduction to the Media Access Control \(MAC\) Layer 2 Sublayer on page 33](#)
- [Understanding MAC Learning on page 34](#)
- [Disabling MAC Learning on page 34](#)
- [Example: Disabling MAC Learning on page 35](#)
- [Configuring MAC Notification \(CLI Procedure\) on page 36](#)
- [Verifying That MAC Notification Is Working Properly on page 37](#)
- [Configuring MAC Limiting \(CLI Procedure\) on page 38](#)
- [Configuring MAC Table Aging on page 40](#)

Introduction to the Media Access Control (MAC) Layer 2 Sublayer

Supported Platforms [EX4600, QFX Series](#)

This topic provides an introduction to the MAC sublayer of the data link layer (Layer 2).

In Layer 2 of a network, the Media Access Control (MAC) sublayer provides addressing and channel access control mechanisms that enable several terminals or network nodes to communicate in a network.

The MAC sublayer acts as an interface between the logical link control (LLC) Ethernet sublayer and Layer 1 (the physical layer). The MAC sublayer emulates a full-duplex logical communication channel in a multipoint network. This channel may provide unicast, multicast, or broadcast communication service. The MAC sublayer uses MAC protocols to prevent collisions.

In Layer 2, multiple devices on the same physical link can uniquely identify one another at the data link layer, by using the MAC addresses that are assigned to all ports on a switch. A MAC algorithm accepts as input a secret key and an arbitrary-length message to be authenticated, and outputs a MAC address.

A MAC address is a 12-digit hexadecimal number (48 bits in long). MAC addresses are usually written in one of these formats:

- MM:MM:MM:SS:SS:SS
- MM-MM-MM-SS-SS-SS

The first half of a MAC address contains the ID number of the adapter manufacturer. These IDs are regulated by an Internet standards body. The second half of a MAC address represents the serial number assigned to the adapter by the manufacturer.

Contrast MAC addressing, which works at Layer 2, with IP addressing, which runs at Layer 3 (networking and routing). One way to remember the difference is that the MAC addresses apply to a physical or virtual node, whereas IP addresses apply to the software implementation of that node. MAC addresses are typically fixed on a per-node basis, whereas IP addresses change when the node moves from one part of the network to another.

IP networks maintain a mapping between the IP and MAC addresses of a node using the Address Resolution Protocol (ARP) table. DHCP also typically uses MAC addresses when assigning IP addresses to nodes.

- Related Documentation**
- [Overview of Layer 2 Networking on page 3](#)
 - [Understanding MAC Learning on page 34](#)

Understanding MAC Learning

Supported Platforms [EX4600, QFabric System, QFX Series standalone switches](#)

MAC learning is the process of obtaining the MAC addresses of all the nodes on a network.

When a node is first connected to an Ethernet LAN or VLAN, it has no information about the other nodes on the network. As data is sent through the network, data packets include a data frame listing their source and destination MAC addresses. The data frame is forwarded to a target port, which is connected to the second device. The MAC address is learned locally at the target port, which facilitates communications for frames that later enter the target port and contain addresses previously learned from a received frame.

By default, MAC learning is enabled on the QFX Series.

- Related Documentation**
- [Introduction to the Media Access Control \(MAC\) Layer 2 Sublayer on page 33](#)
 - [Overview of Layer 2 Networking on page 3](#)

Disabling MAC Learning

Supported Platforms [EX4600, QFX Series standalone switches](#)

By default, MAC learning is globally enabled on all node. This topic describes how to disable MAC learning, as well as how to reenable and verify that MAC learning has been enabled or disabled.



NOTE: This task supports the Enhanced Layer 2 Software (ELS) configuration style. For ELS details, see *Getting Started with Enhanced Layer 2 Software*. If your switch runs software that does not support ELS, see *Disabling MAC Learning*.

Disabling dynamic MAC learning prevents a node from learning source and destination MAC addresses.

- To disable MAC learning:

```
[edit vlans vlan-name switch-options interface interface-name]
user@switch# set no-mac-learning
```

- To enable MAC learning:

```
[edit vlans vlan-name switch-options interface interface-name]
user@switch# delete no-mac-learning
user@switch# deactivate no-mac-learning
```

- To verify the status of MAC learning, view the Ethernet MAC learning statistics in operational mode.

```
user@switch> show ethernet-switching table
Ethernet-switching table: 2 entries, 1 learned
  VLAN      MAC address      Type      Age Interfaces
  default   *                Flood     - All-members
  default   00:1f:12:39:90:80 Learn     29 xe-/0/0.0
```

Related Documentation

- [Understanding MAC Learning on page 34](#)
- [Example: Disabling MAC Learning on page 35](#)
- *no-mac-learning*

Example: Disabling MAC Learning

Supported Platforms [EX4600, QFX Series standalone switches](#)

By default, MAC learning is enabled on the QFX Series. This topic provides examples for disabling, enabling, and verifying the operation of MAC learning on the QFX Series. These examples require that you be logged in as the root user to the switch on which you wish to modify MAC learning.



NOTE: This task uses Junos OS for QFX3500, QFX3600, EX4600, QFX5100, and QFX10002 switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Example: Disabling MAC Learning*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

- To disable MAC learning in a VLAN:

```
[edit]
user@switch# set vlans vlan10 switch-options interface xe-0/0/0.0 no-mac-learning
```

- To reenble MAC learning:

```
[edit] vlans vlan10 switch-options interface xe-0/0/0.0
user@switch# delete no-mac-learning
```

- To verify the status of MAC learning on the QFX Series:

```
user@switch> show ethernet-switching table
Learning stats: 10 learn msg rcvd, 2 error, 0 forced update
Interface          Local pkts    Transit pkts    Error
xe-0/0/0.0          0             6               1
xe-0/0/22.0         0             0               0
xe-0/0/1.0          0             4               1
xe-0/0/2.0          0             0               0
xe-0/0/3.0          0             0               0
xe-0/0/4.0          0             0               0
xe-0/0/19.0         0             0               0
xe-0/0/18.0         0             0               0
xe-0/0/9.0          0             0               0
```

Related Documentation

- [Understanding MAC Learning on page 34](#)
- [Disabling MAC Learning on page 34](#)

Configuring MAC Notification (CLI Procedure)

Supported Platforms EX Series, QFX Series standalone switches



NOTE: This task uses the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Configuring MAC Notification (CLI Procedure)* or *Configuring MAC Notification*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

When a switch learns or unlearns a MAC address, SNMP notifications can be sent to the network management system at regular intervals to record the addition or removal of the MAC address. This process is known as MAC notification.

The MAC notification interval defines how often Simple Network Management Protocol (SNMP) notifications logging the addition or removal of MAC addresses on the switch are sent to the network management system.

MAC notification is disabled by default. When MAC notification is enabled, the default MAC notification interval is 30 seconds.

To enable or disable MAC notification, or to set the MAC notification interval, perform these tasks:

- [Enabling MAC Notification on page 37](#)
- [Disabling MAC Notification on page 37](#)
- [Setting the MAC Notification Interval on page 37](#)

Enabling MAC Notification

MAC notification is disabled by default. You need to perform this procedure to enable MAC notification.

To enable MAC notification on the switch with the default MAC notification interval of 30 seconds:

```
[edit switch-options]
user@switch# set mac-notification
```

To enable MAC notification on the switch with any other MAC notification interval (here, the MAC notification interval is set to 60 seconds):

```
[edit switch-options]
user@switch# set mac-notification notification-interval 60
```

Disabling MAC Notification

MAC notification is disabled by default. Perform this procedure only if MAC notification was previously enabled on your switch.

To disable MAC notification on the switch:

```
[edit switch-options]
user@switch# delete mac-notification
```

To disable MAC notification on a specific interface (here, the interface is ge-0/0/3):

```
[edit switch-options]
user@switch# set interface ge-0/0/3 no-mac-notification
```

Setting the MAC Notification Interval

The default MAC notification interval is 30 seconds. The procedure to change the MAC notification interval to a different interval is identical to the procedure to enable MAC notification on the switch with a nondefault value for the MAC notification interval.

To set the MAC notification interval on the switch (here, the MAC notification interval is set to 5 seconds):

```
[edit switch-options]
user@switch# set mac-notification notification-interval 5
```

Related Documentation

- *Verifying That MAC Notification Is Working Properly*

Verifying That MAC Notification Is Working Properly

Supported Platforms EX4600, QFX Series

Purpose Verify that MAC notification is enabled or disabled, and that the MAC notification interval is set to the specified value.

Action To verify that MAC notification is enabled or disabled and also to verify the MAC notification interval setting.

```
user@switch> show ethernet-switching mac-notification
Notification Status: Enabled
Notification Interval: 60
Notifications Sent      : 0
Notifications Table Maxsize : 256
```

Meaning The output in the **Notification Status** field shows that MAC notification is enabled. The output in the **Notification Status** field would display **Disabled** if MAC notification was disabled.

The **Notification Interval** field output shows that the MAC notification interval is set to 60 seconds.

Related Documentation

- [Configuring MAC Notification](#)
- [Configuring MAC Notification \(CLI Procedure\) on page 36](#)

Configuring MAC Limiting (CLI Procedure)

Supported Platforms [EX Series, QFX Series standalone switches](#)



NOTE: This task uses Junos OS for EX Series switches and QFX3500 and QFX3600 switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see [Configuring MAC Limiting \(CLI Procedure\)](#). For ELS details, see [Getting Started with Enhanced Layer 2 Software](#).

This topic describes various ways of configuring a limitation on MAC addresses in packets that are received and forwarded by the switch.



NOTE: On a QFX Series Virtual Chassis, if you include the shutdown option at the [edit vlans *vlan-name* switch-options interface *interface-name* interface-mac-limit packet-action] hierarchy level and issue the commit operation, the system generates a commit error. The system does not generate an error if you include the shutdown option at the [edit switch-options interface *interface-name* interface-mac-limit packet-action] hierarchy level.

The different ways of setting a MAC limit are described in the following sections:

- [Limiting the Number of MAC Addresses Learned by an Interface on page 39](#)
- [Limiting the Number of MAC Addresses Learned by a VLAN on page 39](#)

Limiting the Number of MAC Addresses Learned by an Interface

To secure a port, you can set the maximum number of MAC addresses that can be learned by an interface:

- Set the MAC limit on an interface, and specify an action that the switch takes after the specified limit is exceeded:

```
[edit switch-options]
user@switch# set interface interface-name interface-mac-limit limit packet-action
action
```

After you set a new MAC limit for the interface, the system clears existing entries in the MAC address forwarding table associated with the interface.

Limiting the Number of MAC Addresses Learned by a VLAN

To limit the number of MAC addresses learned by a VLAN, perform both of the following steps:

- Set the maximum number of MAC addresses that can be learned by a VLAN, and specify an action that the switch takes after the specified limit is exceeded:

```
[edit vlans]
user@switch# set vlan-name switch-options mac-table-size limit packet-action
action
```

- Set the maximum number of MAC addresses that can be learned by one or all interfaces in the VLAN, and specify an action that the switch takes after the specified limit is exceeded:

```
[edit vlans]
user@switch# set vlan-name switch-options interface interface-name
interface-mac-limit limit packet-action action
[edit vlans]
user@switch# set vlan-name switch-options interface-mac-limit limit packet-action
action
```



NOTE: If you specify a MAC limit and packet action for all interfaces in the VLAN *and* a specific interface in the VLAN, the MAC limit and packet action specified at the specific interface level takes precedence. Also, at the VLAN interface level, only the drop and drop-and-log options are supported.

After you set new MAC limits for a VLAN by using the **mac-table-size** statement or for interfaces associated with a VLAN by using the **interface-mac-limit** statement, the system clears the corresponding existing entries in the MAC address forwarding table.

- Related Documentation**
- Understanding Bridging and VLANs on EX Series Switches*
 - Configuring Persistent MAC Learning (CLI Procedure)*

Configuring MAC Table Aging

Supported Platforms [EX4600, QFX Series standalone switches](#)

MAC table aging ensures that a switch tracks only active nodes on the network and that it is able to flush out network nodes that are no longer available.

To manage MAC entries more efficiently, you can configure the maximum time that entries can remain in the MAC address table before being deleted.



NOTE: This task uses Junos OS for QFX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

You can use the **global-mac-table-aging-time** command to configure how long entries remain in the Ethernet switching table before expiring, as follows:

```
[edit protocols 12-learning]
user@switch# set global-mac-table-aging-time 200
```



NOTE: This command applies to all VLANs configured for the switch. You cannot configure separate MAC table aging times for specific VLANs.

- Related Documentation**
- [Understanding Bridging and VLANs on page 7](#)
 - [Example: Setting Up Bridging with Multiple VLANs](#)

PART 3

Spanning Trees

- [Using Spanning Trees on page 43](#)

CHAPTER 3

Using Spanning Trees

- Overview of Spanning-Tree Protocols on page 43
- Understanding RSTP on page 45
- Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46
- Configuring RSTP (CLI Procedure) on page 63
- Understanding VSTP on page 64
- Configuring VSTP (CLI Procedure) on page 65
- Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on page 67
- Configuring BPDU Protection on Spanning Tree Interfaces on page 72
- Unblocking an Interface That Receives BPDUs in Error (CLI Procedure) on page 73

Overview of Spanning-Tree Protocols

Supported Platforms EX4600, QFabric System, QFX Series standalone switches

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). The default spanning-tree protocol on the QFX Series is RSTP. RSTP provides faster convergence times than STP. However, some legacy networks require the slower convergence times of basic STP.

The STP support provided for the QFX Series includes:

- IEEE 802.1d
- 802.1w RSTP
- 802.1s MSTP

If your network includes IEEE 802.1D 1998 bridges, you can remove RSTP and explicitly configure STP. When you explicitly configure STP, the QFX Series products 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. If you use virtual LANs (VLANs), you should enable VSTP and use it on your network. See [“Understanding VSTP” on page 64](#).

You can use the same operational commands (**show spanning-tree bridge** and **show spanning-tree interface**) to check the status of your spanning-tree configuration, regardless of which spanning-tree protocol has been configured.

STP uses bridge protocol data unit (BPDU) packets to exchange information with other switches. BPDUs send hello packets out at regular intervals to exchange information across bridges and detect loops in a network topology. There are two types of BPDUs:

- Configuration BPDUs—These BPDUs contain configuration information about the transmitting switch and its ports, including switch and port MAC addresses, switch priority, port priority, and port cost.
- Topology change notification (TCN) BPDUs—When a bridge needs to signal a topology change, it starts to send TCNs on its root port. The designated bridge receives the TCN, acknowledges it, and generates another one for its own root port. The process continues until the TCN reaches the root bridge.

STP uses the information provided by the BPDUs to elect a root bridge, identify root ports for each switch, identify designated ports for each physical LAN segment, and prune specific redundant links to create a loop-free tree topology. All leaf devices calculate the best path to the root device and place their ports in blocking or forwarding states based on the best path to the root. The resulting tree topology provides a single active Layer 2 data path between any two end stations.

Understanding Spanning Tree Protocols on a QFabric System

Although there is no need to run STP in a QFabric system, you can connect a QFabric system to another Layer 2 device and use STP. STP traffic can only be processed on network Node groups. Other Node groups, such as redundant server Node groups and server Node groups, discard the STP bridge protocol data units (BPDUs) traffic and disable the interface automatically. Server Node groups only process host-facing protocols, whereas Network Node groups process all supported protocols.

- Related Documentation**
- [Understanding BPDU Protection for STP, RSTP, and MSTP](#)
 - [Understanding MSTP](#)
 - [Understanding RSTP on page 45](#)
 - [Understanding VSTP on page 64](#)

Understanding RSTP

Supported Platforms [EX4600, QFX Series](#)

Juniper Networks QFX Series products use Rapid Spanning Tree Protocol (RSTP) on the network side of the QFX Series to provide quicker convergence time than the base Spanning Tree Protocol (STP) does. RSTP identifies certain links as point to point. When a point-to-point link fails, the alternate link can transition to the forwarding state, which speeds up convergence.

Although STP provides basic loop prevention functionality, it does not provide fast network convergence when there are topology changes. The STP process to determine network state transitions is slower than the RSTP process because it is timer-based. A device must reinitialize every time a topology change occurs. The device must start in the listening state and transition to the learning state and eventually to a forwarding or blocking state. When default values are used for the maximum age (20 seconds) and forward delay (15 seconds), it takes 50 seconds for the device to converge. RSTP converges faster because it uses a handshake mechanism based on point-to-point links instead of the timer-based process used by STP.

For networks with virtual LANs (VLANs), you can use VLAN Spanning Tree Protocol (VSTP), which takes the paths of each VLAN into account when calculating routes. VSTP uses RSTP by default.

An RSTP domain running from the edge outward on a QFX Series product has the following components:

- A *root port*, which is the “best path” to the root device.
- A *designated port*, which indicates that the switch is the designated bridge for the other switch connecting to this port.
- An *alternate port*, which provides an alternate root port.
- A *backup port*, which provides an alternate designated port.

Port assignments change through messages exchanged throughout the domain. An RSTP device generates configuration messages once per hello time interval. If an RSTP device does not receive a configuration message from its neighbor after an interval of three hello times, it determines that the connection with the neighbor is lost. When a *root port* or a *designated port* fails on a device, the device generates a configuration message with the proposal bit set. Once its neighbor device receives this message, it verifies that this configuration message is valid for that port and starts a *synchronizing* operation to ensure that all of its ports are in sync with the new information.

Similar sets of messages propagate through the network, restoring the connectivity very quickly after a topology change (in a well-designed network that uses RSTP, network convergence can take as little as 0.5 seconds). If a device does not receive an agreement to a proposal message it has sent, it returns to the original IEEE 802.D convention.

RSTP was originally defined in the IEEE 802.1w draft specification and later incorporated into the IEEE 802.1D-2004 specification.

VSTP and RSTP can be configured at the same time. If you configure VSTP and RSTP at the same time and the switch has more than 253 VLANs, VSTP is configured only for the first 253 VLANs. For the remaining VLANs, only RSTP is configured. RSTP and VSTP are the only spanning-tree protocols that can be configured at the same time on the QFX Series.

**Related
Documentation**

- [Overview of Spanning-Tree Protocols on page 43](#)
- [Understanding MSTP](#)
- [Understanding VSTP on page 64](#)
- [Example: Configuring Faster Convergence and Improving Network Stability with RSTP](#)
- [Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46](#)
- [Configuring RSTP \(CLI Procedure\) on page 63](#)

[Example: Configuring Faster Convergence and Improved Network Stability with RSTP](#)

Supported Platforms [EX Series, QFX Series](#)



NOTE: This example uses Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Example: Faster Convergence and Improved Network Stability with RSTP on EX Series Switches*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

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 47](#)
- [Overview and Topology on page 47](#)
- [Configuring RSTP and Nonstop Bridging on Switch 1 on page 49](#)
- [Configuring RSTP and Nonstop Bridging on Switch 2 on page 52](#)

- [Configuring RSTP and Nonstop Bridging on Switch 3 on page 55](#)
- [Configuring RSTP and Nonstop Bridging on Switch 4 on page 58](#)
- [Verification on page 61](#)

Requirements

This example uses the following software and hardware components:

- Junos OS Release 15.1 or later or later for EX Series switches
- Four EX Series switches

Before you configure the switches for RSTP, 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

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 2 on page 48](#) to create a loop-free topology with NSB applied to switches with dual Routing Engines.

Figure 2: Network Topology for RSTP

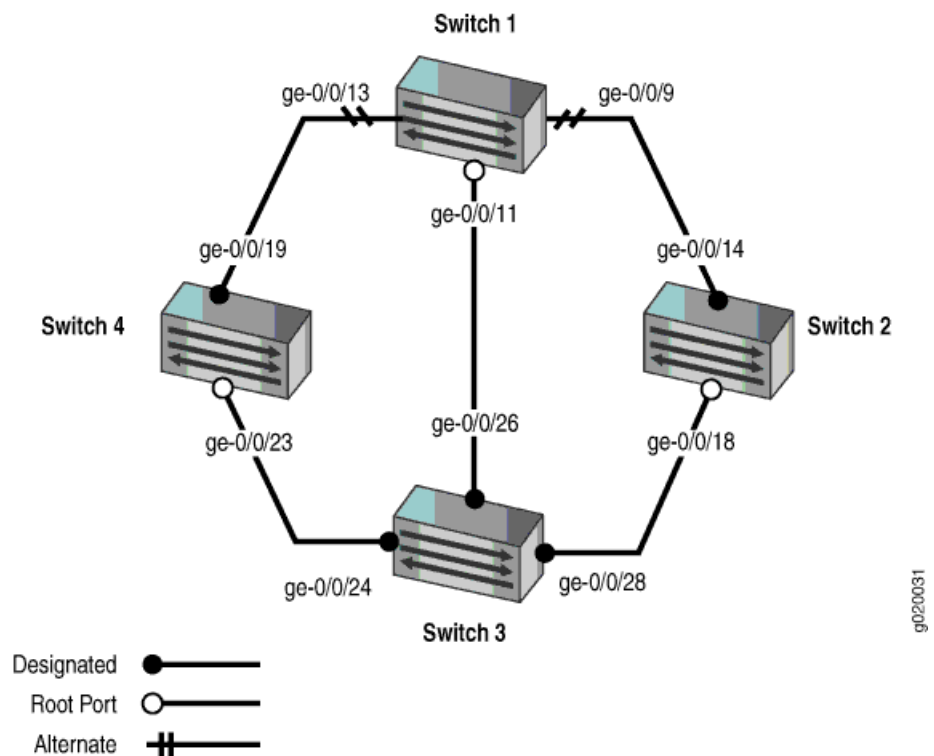


Table 6 on page 48 shows the components of the topology for this example.



NOTE: You can configure RSTP only on physical interfaces, not on logical interfaces.

Table 6: 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"> • ge-0/0/9 is connected to Switch 2 • ge-0/0/13 is connected to Switch 4 • ge-0/0/11 is connected to Switch 3 |
| Switch 2 | <p>The following interfaces on Switch 2 are connected in this way:</p> <ul style="list-style-type: none"> • ge-0/0/14 is connected to Switch 1 • ge-0/0/18 is connected to Switch 3 |
| Switch 3 | <p>The following interfaces on Switch 3 are connected in this way:</p> <ul style="list-style-type: none"> • ge-0/0/26 is connected to Switch 1 • ge-0/0/28 is connected to Switch 2 • ge-0/0/24 is connected to Switch 4 |

Table 6: 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"> • <code>ge-0/0/19</code> is connected to Switch 1 • <code>ge-0/0/23</code> is connected to Switch 3 |
| VLAN names and tag IDs | <p>voice-vlan, tag 10 employee-vlan, tag 20 guest-vlan, tag 30 camera-vlan, 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 vlan members [10 20 30 40]
set interfaces ge-0/0/13 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/9 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/11 unit 0 family ethernet-switching interface-mode trunk
```

```

set protocols rstp bridge-priority 16k
set protocols rstp interface all cost 1000
set protocols rstp interface all 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 protocols layer2-control 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 interface-mode trunk
user@switch1# set ge-0/0/9 unit 0 family ethernet-switching interface-mode trunk
user@switch1# set ge-0/0/11 unit 0 family ethernet-switching interface-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch1# rstp bridge-priority 16k
user@switch1# rstp interface all cost 1000
user@switch1# rstp interface all 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 protocols layer2-control]
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 {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/9 {
    unit 0 {
      family ethernet-switching {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/11 {
    unit 0 {
      family ethernet-switching {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
}
protocols {
  layer2-control {
    nonstop-bridging;
  }
  rstp {
    bridge-priority 16k;
  }
}
```

```
        interface ge-0/0/13 {
            cost 1000;
            mode point-to-point;
        }
        interface ge-0/0/9 {
            cost 1000;
            mode point-to-point;
        }
        interface ge-0/0/11 {
            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;
    }
}
```

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 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 interface-mode trunk
set interfaces ge-0/0/18 unit 0 family ethernet-switching interface-mode trunk
set protocols rstp bridge-priority 32k
set protocols rstp interface ge-0/0/14 cost 1000
```

```

set protocols rstp interface ge-0/0/14 mode point-to-point
set protocols rstp interface ge-0/0/18 cost 1000
set protocols rstp interface ge-0/0/18 mode point-to-point

```



NOTE: Starting with Junos OS Release 15.1 for EX Series and QFX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, you can configure spanning tree parameters globally on all spanning tree interfaces. See [“Configuring RSTP \(CLI Procedure\)” on page 63](#) for additional information.

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 protocols layer2-control 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 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 interface-mode trunk
user@switch2# set ge-0/0/18 unit 0 family ethernet-switching interface-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch2# rstp bridge-priority 32k
user@switch2# rstp interface ge-0/0/14 cost 1000
user@switch2# rstp interface ge-0/0/14 mode point-to-point
user@switch2# rstp interface ge-0/0/18 cost 1000
user@switch2# rstp interface ge-0/0/18 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
```
2. 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.
3. Enable nonstop bridging:

```
[edit protocols layer2-control]
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 {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/18 {
    unit 0 {
      family ethernet-switching {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
}
protocols {
  layer2-control {
    nonstop-bridging;
  }
}
```



```

rstp {
    bridge-priority 32k;
    interface ge-0/0/14 {
        cost 1000;
        mode point-to-point;
    }
    interface ge-0/0/18 {
        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;
    }
}

```

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 interface-mode trunk
set interfaces ge-0/0/28 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/24 unit 0 family ethernet-switching interface-mode trunk
set protocols rstp bridge-priority 8k
set protocols rstp interface ge-0/0/26 cost 1000

```

```

set protocols rstp interface ge-0/0/26 mode point-to-point
set protocols rstp interface ge-0/0/28 cost 1000
set protocols rstp interface ge-0/0/28 mode point-to-point
set protocols rstp interface ge-0/0/24 cost 1000
set protocols rstp interface ge-0/0/24 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 protocols layer2-control 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 interface-mode trunk
user@switch3# set ge-0/0/28 unit 0 family ethernet-switching interface-mode trunk
user@switch3# set ge-0/0/24 unit 0 family ethernet-switching interface-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch3# rstp bridge-priority 8k
user@switch3# rstp interface ge-0/0/26 cost 1000
user@switch3# rstp interface ge-0/0/26 mode point-to-point
user@switch3# rstp interface ge-0/0/28 cost 1000
user@switch3# rstp interface ge-0/0/28 mode point-to-point
user@switch3# rstp interface ge-0/0/24 cost 1000
user@switch3# rstp interface ge-0/0/24 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 protocols layer2-control]
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 {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/28 {
    unit 0 {
      family ethernet-switching {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
  ge-0/0/24 {
    unit 0 {
      family ethernet-switching {
        interface-mode trunk;
        vlan {
          members [10 20 30 40];
        }
      }
    }
  }
}
```

```
protocols {
  layer2-control {
    nonstop-bridging;
  }
  rstp {
    bridge-priority 8k;
    interface ge-0/0/26 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/28 {
      cost 1000;
      mode point-to-point;
    }
    interface ge-0/0/24 {
      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;
  }
}
```

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 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 interface-mode trunk
set interfaces ge-0/0/19 unit 0 family ethernet-switching interface-mode trunk
set protocols rstp bridge-priority 16k
set protocols rstp interface ge-0/0/23 cost 1000
set protocols rstp interface ge-0/0/23 mode point-to-point
set protocols rstp interface ge-0/0/19 cost 1000
set protocols rstp interface ge-0/0/19 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 protocols layer2-control 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 interface-mode trunk
user@switch4# set ge-0/0/19 unit 0 family ethernet-switching interface-mode trunk

```

4. Configure RSTP on the switch:

```

[edit protocols]
user@switch4# rstp bridge-priority 16k
user@switch4# rstp interface ge-0/0/23 cost 1000
user@switch4# rstp interface ge-0/0/23 mode point-to-point
user@switch4# rstp interface ge-0/0/19 cost 1000
user@switch4# rstp interface ge-0/0/19 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 protocols layer2-control]
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 {
 interface-mode trunk;
 vlan {
 members [10 20 30 40];
 }
 }
 }
 }
 ge-0/0/19 {
 unit 0 {
 family ethernet-switching {
 interface-mode trunk;
 vlan {
 members [10 20 30 40];
 }
 }
 }
 }
}
protocols {
 layer2-control {
 nonstop-bridging;
 }
 rstp {
 bridge-priority 16k;
 interface ge-0/0/23 {
 cost 1000;
 mode point-to-point;
 }
 }
}
```

```
 }
 interface ge-0/0/19 {
 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;
 }
}
```

## Verification

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

- [Verifying RSTP Configuration on Switch 1 on page 61](#)
- [Verifying RSTP Configuration on Switch 2 on page 62](#)
- [Verifying RSTP Configuration on Switch 3 on page 62](#)
- [Verifying RSTP Configuration on Switch 4 on page 63](#)

### 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<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-----------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/13 | 128:526 | 128:526               | 16384.0019e25040e0      | 1000         | BLK   | ALT  |
| ge-0/0/9  | 128:522 | 128:522               | 32768.0019e2503d20      | 1000         | BLK   | ALT  |
| ge-0/0/11 | 128:524 | 128:524               | 8192.0019e25051e0       | 1000         | FWD   | ROOT |

**Meaning** Refer to the topology in [Figure 2 on page 48](#). The operational mode command **show spanning-tree interface** shows that **ge-0/0/13** 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<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-----------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/14 | 128:527 | 128:527               | 32768.0019e2503d20      | 1000         | FWD   | DESG |
| ge-0/0/18 | 128:529 | 128:529               | 8192.0019e25051e0       | 1000         | FWD   | ROOT |

**Meaning** Refer to the topology in [Figure 2 on page 48](#). The operational mode command **show spanning-tree interface** shows that **ge-0/0/18** 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<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-----------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/26 | 128:539 | 128:539               | 8192.0019e25051e0       | 1000         | FWD   | DESG |
| ge-0/0/28 | 128:541 | 128:541               | 8192.0019e25051e0       | 1000         | FWD   | DESG |
| ge-0/0/24 | 128:537 | 128:537               | 8192.0019e25051e0       | 1000         | FWD   | DESG |

**Meaning** Refer to the topology in [Figure 2 on page 48](#). 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<br>port ID | Designated<br>bridge ID | Port<br>Cost | State | Role |
|-----------|---------|-----------------------|-------------------------|--------------|-------|------|
| ge-0/0/23 | 128:536 | 128:536               | 8192.0019e25051e0       | 1000         | FWD   | ROOT |
| ge-0/0/19 | 128:532 | 128:532               | 16384.0019e25040e0      | 1000         | FWD   | DESG |

**Meaning** Refer to the topology in [Figure 2 on page 48](#). The operational mode command **show spanning-tree interface** shows that interface **ge-0/0/23** is the root interface and forwarding.

**Related Documentation**

- 95775 [Configuring RSTP \(CLI Procedure\) on page 63](#)
- Understanding RSTP for EX Series and QFX Series Switches*

## Configuring RSTP (CLI Procedure)

**Supported Platforms** [EX Series](#)

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). Because RSTP is configured by default, you only need to use this procedure if another spanning-tree protocol has been configured. In that case, you can reconfigure RSTP.

To enable RSTP:

1. Disable the other configured spanning-tree protocol (MSTP):

- To disable MSTP:

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

2. Configure RSTP

- To enable RSTP on a specific interface:

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

- To disable RSTP on a specific interface:

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

- To enable RSTP on a range of interfaces:

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

- To enable RSTP on all interfaces:

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

#### Related Documentation

- *show spanning-tree bridge*
- *show spanning-tree interface*
- *Understanding RSTP for EX Series and QFX Series Switches*

---

## Understanding VSTP

### Supported Platforms [EX4600, QFX Series](#)

VLAN Spanning Tree Protocol (VSTP) enables Juniper Networks switches to run one or more Spanning Tree Protocol (STP) or Rapid Spanning Tree Protocol (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.

You can configure VSTP for a maximum of 509 VLANs.

VSTP and RSTP can be configured at the same time. If you configure VSTP and RSTP at the same time and the switch has more than 253 VLANs, VSTP is configured only for the first 253 VLANs. For the remaining VLANs, only RSTP is configured. RSTP and VSTP are the only spanning-tree protocols that can be configured at the same time on a switch.



**NOTE:** We recommend that you enable VSTP on all VLANs that could receive VSTP bridge protocol data units (BPDUs).

**Related  
Documentation**

- [Example: Configuring VSTP on QFX Series Switches and EX4600 Switches](#)
- [Overview of Spanning-Tree Protocols on page 43](#)
- [Understanding RSTP on page 45](#)
- [Configuring VSTP \(CLI Procedure\) on page 65](#)
- [Configuring VLAN Spanning-Tree Protocol](#)

---

## Configuring VSTP (CLI Procedure)

---

**Supported Platforms**   [EX Series](#)



**NOTE:** This topic applies to Junos OS for EX Series and QFX switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Configuring VSTP (CLI Procedure)*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

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:** 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.

You can configure VSTP 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 within any of the following scopes:

- 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*
- *show spanning-tree interface*
- *Understanding VSTP for EX Series Switches and QFX Series Switches*

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

Supported Platforms [EX Series](#), [QFX Series](#)

EX Series and QFX Series switches provide Layer 2 loop prevention through 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 68](#)
- [Overview and Topology on page 68](#)
- [Configuration on page 69](#)
- [Verification on page 70](#)

## Requirements

This example uses the following software and hardware components:

- Two EX Series switches in an RSTP topology
- Junos OS Release 13.2X50-D10 or later or later for EX Series or QFX 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 RSTP or MSTP topology, however, can lead to network outages by triggering an STP misconfiguration. To prevent such outages, enable BPDU protection on spanning tree 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 spanning tree interface.

[Figure 3 on page 69](#) 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** and interface **ge-0/0/6** 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

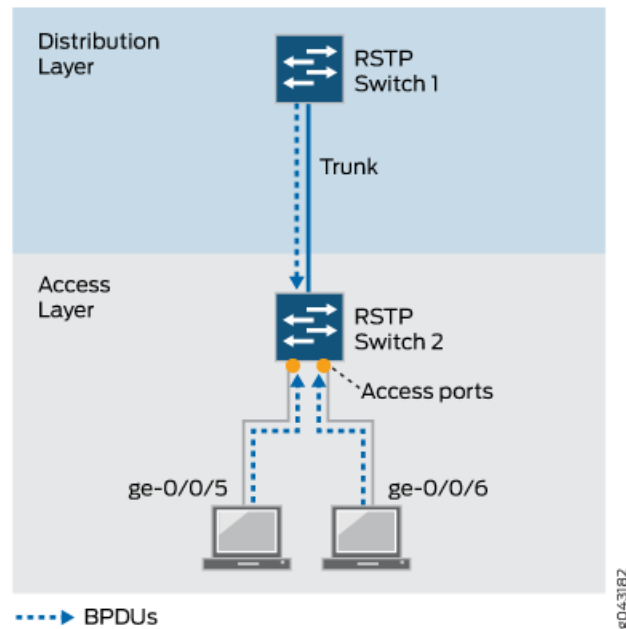


Table 7 on page 69 shows the components that will be configured for BPDU protection.

Table 7: 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>• <b>ge-0/0/5</b></li> <li>• <b>ge-0/0/6</b></li> </ul> |

This configuration example uses RSTP topology. You also can configure BPDU protection for MSTP topologies at the `[edit protocols mstp]` 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:



**NOTE:** This example configures BPDU protection on specific interfaces. However, starting with Junos OS Release 15.1 for EX Series and QFX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, you can configure BPDU protection globally on all spanning tree interfaces. See [“Configuring BPDU Protection on Spanning Tree Interfaces” on page 72](#) for additional information.

```
[edit]
set protocols rstp interface ge-0/0/5 edge
set protocols rstp interface ge-0/0/6 edge
set protocols rstp bpdv-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** and interface **ge-0/0/6**, and configure them as edge ports:

```
[edit protocols rstp]
user@switch# set interface ge-0/0/5 edge
user@switch# set interface ge-0/0/6 edge
```

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

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

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

```
user@switch> show configuration protocols rstp
interface ge-0/0/5 {
 edge;
}
interface ge-0/0/6 {
 edge;
}
bpdv-block-on-edge;
```

## Verification

To confirm that the configuration is working properly:

- [Displaying the Interface State Before BPDU Protection Is Triggered on page 70](#)
- [Verifying That BPDU Protection Is Working Correctly on page 71](#)

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

**Purpose** Before BPDUs can be received from PCs connected to interface **ge-0/0/5** and interface **ge-0/0/6**, 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  | 128:513 | 128:513               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/1  | 128:514 | 128:514               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/2  | 128:515 | 128:515               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/3  | 128:516 | 128:516               | 32768.0019e2503f00      | 20000        | FWD   | DESG |
| ge-0/0/4  | 128:517 | 128:517               | 32768.0019e2503f00      | 20000        | FWD   | DESG |
| ge-0/0/5  | 128:518 | 128:518               | 32768.0019e2503f00      | 20000        | FWD   | DESG |
| ge-0/0/6  | 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** and interface **ge-0/0/6** 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** and interface **ge-0/0/6**. 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     | 128:513 | 128:513               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/1     | 128:514 | 128:514               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/2     | 128:515 | 128:515               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| ge-0/0/3     | 128:516 | 128:516               | 32768.0019e2503f00      | 20000        | FWD   | DESG |
| ge-0/0/4     | 128:517 | 128:517               | 32768.0019e2503f00      | 20000        | FWD   | DESG |
| ge-0/0/5     | 128:518 | 128:518               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| (Bpdu-Incon) |         |                       |                         |              |       |      |
| ge-0/0/6     | 128:519 | 128:519               | 32768.0019e2503f00      | 20000        | BLK   | DIS  |
| (Bpdu-Incon) |         |                       |                         |              |       |      |
| ge-0/0/7     | 128:520 | 128:1                 | 16384.00aabbcc0348      | 20000        | FWD   | ROOT |
| ge-0/0/8     | 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** and interface **ge-0/0/6** 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 reenables 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 error bpd** to unblock and reen able 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*
- *Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches*
- *Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX Series Switches*
- *Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX Series Switches*
- *Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches*

---

## Configuring BPDU Protection on Spanning Tree Interfaces

---

**Supported Platforms**   [EX Series](#), [QFX Series](#)



**NOTE:** This topic applies to Junos OS for EX Series and QFX switches with support for the Enhanced Layer 2 Software (ELS) configuration style. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

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

To configure BPDU protection for spanning-tree instance interfaces:

- On a specific spanning-tree interface:

1. To enable BPDU protection on a specified spanning-tree interface:

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

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

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

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

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

- To disable BPDU protection for a specific spanning-tree interface

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

#### Related Documentation

- [Understanding BPDU Protection for Spanning-Tree Instance Interfaces](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces](#)
- [clear error bpd interface on page 248](#)

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

**Supported Platforms**    EX Series, QFX Series

EX Series and QFX 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 protocols layer 2]
```

```
user@switch# set protocols layer2-control bpdv-block disable-timeout 30
```

All interfaces on the switch will be reenabled (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 error bpdv interface ge-0/0/6
```

This command will only reenable 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 page 67](#)
- *Example: Configuring BPDU Protection on Interfaces to Prevent STP Miscalculations on EX Series Switches*
- *Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches*

## PART 4

# Q-in-Q Tunneling

- [Using Q-in-Q Tunneling on page 77](#)



## CHAPTER 4

# Using Q-in-Q Tunneling

- [Understanding Q-in-Q Tunneling on page 77](#)
- [Configuring Q-in-Q Tunneling on page 82](#)
- [Configuring All-in-One Bundling on page 89](#)
- [Configuring Many-to-Many Bundling on page 91](#)
- [Configuring a Specific Interface Mapping with VLAN ID Translation Option on page 94](#)

## Understanding Q-in-Q Tunneling

---

**Supported Platforms**    [EX4600, QFX Series standalone switches](#)



**NOTE:** This topic applies to Junos OS switches with support for the Enhanced Layer 2 Software (ELS) configuration style. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

Q-in-Q tunneling enables service providers on Ethernet access networks to extend a Layer 2 Ethernet connection between two customer sites. Using Q-in-Q tunneling, providers can also segregate or bundle customer traffic into fewer VLANs or different VLANs by adding another layer of 802.1Q tags. Q-in-Q tunneling is useful when customers have overlapping VLAN IDs because customers' VLAN (C-VLAN) tags are prepended by the service-provider VLAN (S-VLAN) tag, which allows you to preserve each customers' VLAN IDs without conflict. The Juniper Networks Junos operating system (Junos OS) implementation of Q-in-Q tunneling supports the IEEE 802.1ad standard.

This topic describes:

- [How Q-in-Q Tunneling Works on page 78](#)
- [How VLAN Translation Works on page 78](#)
- [Sending and Receiving Untagged Packets on page 78](#)
- [Disabling MAC Address Learning on page 79](#)
- [Mapping C-VLANs to S-VLANs on page 79](#)
- [Constraints for Q-in-Q Tunneling and VLAN Translation on page 80](#)

## How Q-in-Q Tunneling Works

In Q-in-Q tunneling, as a packet travels from a C-VLAN to an S-VLAN, a service-provider-specific 802.1Q tag is added to the packet. This additional tag is used to segregate traffic into S-VLANs. The original customer 802.1Q tag of the packet is retained and is transmitted transparently, passing through the service provider's network. As the packet leaves the S-VLAN in the downstream direction, the additional 802.1Q tag is removed.

When Q-in-Q tunneling is enabled, trunk interfaces are assumed to be part of the service provider or data center network. Access interfaces are assumed to be customer-facing and accept both tagged and untagged frames. This topic refers to trunk interfaces as S-VLAN interfaces. This type of interface is also known as a network-to-network interface (NNI). The topic refers to access interfaces as C-VLAN interfaces. This type of interface is also known as a user-network interface (UNI).



---

### NOTE:

---

An interface can be a member of multiple S-VLANs. You can map one C-VLAN to one S-VLAN (1:1) or many C-VLANs to many S-VLANs (N:N). C-VLAN and S-VLAN tags are unique—for instance, you can have both a C-VLAN tag of 101 and an S-VLAN tag of 101. You can limit the set of accepted customer tags to a range of tags or to discrete values. Class-of-service (CoS) values of C-VLANs are unchanged in the downstream direction. You may copy ingress priority and CoS settings to the S-VLAN.

C-VLAN and S-VLAN interfaces accept priority-tagged packets without any configuration.

## How VLAN Translation Works

VLAN translation replaces an incoming C-VLAN tag with an S-VLAN tag instead of adding an additional tag. The C-VLAN tag is therefore lost, so a single-tagged packet is normally untagged when it leaves the S-VLAN (at the other end of the link). If an incoming packet has had Q-in-Q tunneling applied in advance, VLAN translation replaces the outer tag and the inner tag is retained when the packet leaves the S-VLAN at the other end of the link.

To configure VLAN translation, use the *mapping swap* statement at the **[edit vlans interface]** hierarchy level.



---

**NOTE:** You can configure VLAN translation on access ports only. You cannot configure it on trunk ports, and you cannot configure Q-in-Q tunneling on the same access port.

---

## Sending and Receiving Untagged Packets

To enable an interface to send and receive untagged packets, you must specify a native VLAN for a physical interface. When the interface receives an untagged packet, it adds



the VLAN ID of the native VLAN to the packet and sends the newly tagged packet to the mapped interface.

To specify a native VLAN, use the **native-vlan-id** statement at the **[edit interfaces interface-name]** hierarchy level. The native VLAN ID must match the C-VLAN or S-VLAN ID or be included in the VLAN ID list specified on the logical interface.

For example, on a logical interface for a C-VLAN interface, you might specify a C-VLAN ID list of 100-200. Then, on the C-VLAN physical interface, you could specify a native VLAN ID of 150. This configuration would work because the native VLAN of 150 is included in the C-VLAN ID list of 100-200.

We recommend configuring a native VLAN when using any of the approaches to map C-VLANs to S-VLANs. If you do not configure a native VLAN on an interface, untagged packets received by the interface are discarded. See the Mapping C-VLANs to S-VLANs section in this topic for information about the methods of mapping C-VLANs to S-VLANs.

## Disabling MAC Address Learning

In a Q-in-Q deployment, customer packets interfaces are transported without any changes to source and destination MAC addresses. You can disable MAC address learning at the global, interface, and VLAN levels:

- To disable learning globally, disable MAC address learning for the switch.
- To disable learning for an interface, disable MAC address learning for all VLANs of which the specified interface is a member.
- To disable learning for a VLAN, disable MAC address learning for a specified VLAN.

## Mapping C-VLANs to S-VLANs

There are three ways to map C-VLANs to S-VLANs:

- [All-in-One Bundling on page 79](#)
- [Many-to-Many Bundling on page 80](#)
- [Mapping a Specific Interface on page 80](#)

If you configure multiple mapping methods, the switch gives priority to mapping a specific interface, then to many-to-many bundling, and last to all-in-one bundling. However, for a particular mapping method, setting up overlapping rules for the same C-VLAN is not supported.

### All-in-One Bundling

All-in-one bundling maps all packets from all C-VLAN interfaces to an S-VLAN.

The C-VLAN interface accepts untagged and single-tagged packets. An S-VLAN 802.1Q tag is then added to these packets, and the packets are sent to the S-VLAN interface, which accepts untagged, single-tagged, and double-tagged packets.



**NOTE:** The C-VLAN and S-VLAN interfaces accept untagged packets provided that the `native-vlan-id` statement is configured on these interfaces.

---

### Many-to-Many Bundling

Many-to-many bundling is used to specify which C-VLANs are mapped to which S-VLANs.

Use many-to-many bundling when you want a subset of the C-VLANs on the access switch to be part of multiple S-VLANs. With many-to-many bundling, the C-VLAN interfaces accept untagged and single-tagged packets. An S-VLAN 802.1Q tag is then added to these packets, and the packets are sent to the S-VLAN interfaces, which accept untagged, single-tagged, and double-tagged packets.



**NOTE:** The C-VLAN and S-VLAN interfaces accept untagged packets provided that the `native-vlan-id` statement is configured on these interfaces.

---

### Mapping a Specific Interface

Use specific interface mapping when you want to assign an S-VLAN to a specific C-VLAN on an interface. The configuration applies only to the specific interface, not to all access interfaces.

Specific interface mapping has two suboptions: **push** and **swap**. When traffic that is mapped to a specific interface is pushed, the packet retains its original tag as it moves from the C-VLAN to the S-VLAN and an additional S-VLAN tag is added to the packet. When traffic that is mapped to a specific interface is swapped, the incoming tag is replaced with a new VLAN tag. This is sometimes known as VLAN rewriting or VLAN translation.

Typically, this method is used to keep data from different customers separate or to provide individualized treatment of the packets on a certain interface. You might also use this method to map VLAN traffic from different customers to a single S-VLAN.

When using specific interface mapping, the C-VLAN interfaces accept untagged and single-tagged packets, while the S-VLAN interfaces accept untagged, single-tagged, and double-tagged packets.



**NOTE:** The C-VLAN and S-VLAN interfaces accept untagged packets provided that the `native-vlan-id` statement is configured on these interfaces.

---

## Constraints for Q-in-Q Tunneling and VLAN Translation

Be aware of the following constraints when configuring Q-in-Q tunneling and VLAN translation:

- With releases of Junos OS 13.2X51 previous to 13.2X51-D20, you cannot create a regular VLAN on an interface if you have created an S-VLAN or C-VLAN on that interface for Q-in-Q tunneling. This means that you cannot create an integrated routing and bridging (IRB) interface on that interface because regular VLANs are a required part of IRB configuration. With Junos OS 13.2X51-D25, you can create a regular VLAN on a trunk interface that has an S-VLAN, which means that you can also create an IRB interface on the trunk. In this case, the regular VLAN and S-VLAN on the same trunk interface cannot share the same VLAN ID. Junos OS 13.2X51-D25 does not allow you to create a regular VLAN on an access interface that has a C-VLAN.
- Most access port security features are not supported with Q-in-Q tunneling and VLAN translation.
- Configuring Q-in-Q tunneling and VLAN rewriting/VLAN translation on the same port is not supported.
- You can configure at most one VLAN rewrite/VLAN translation for a given VLAN and interface. For example, you can create no more than one translation for VLAN 100 on interface xe-0/0/0.
- The combined total of VLANs and rules for Q-in-Q tunneling and VLAN translation cannot exceed 6000. For example, you can configure and commit 4000 VLANs and 2000 rules for Q-in-Q tunneling and VLAN translation. However, you cannot configure 4000 VLANs and 2500 rules for Q-in-Q tunneling and VLAN translation. If you try to commit a configuration that exceeds the limit, you see CLI and syslog errors that inform you about the problem.
- MAC addresses are learned from S-VLANs, not C-VLANs.
- Broadcast, unknown unicast, and multicast traffic is forwarded to all members in the S-VLAN.
- The following features are not supported with Q-in-Q tunneling:
  - DHCP relay
  - Fibre Channel over Ethernet
  - IP Source Guard
- The following features are not supported with VLAN rewriting/VLAN translation:
  - Fibre Channel over Ethernet
  - Firewall filter applied to a port or VLAN in the output direction
  - Private VLANs
  - VLAN Spanning Tree Protocol
  - Reflective relay

**Related  
Documentation**

- [Configuring Q-in-Q Tunneling on page 82](#)

## Configuring Q-in-Q Tunneling

---

**Supported Platforms** [EX4600, QFX Series standalone switches](#)

Q-in-Q tunneling and VLAN translation allow service providers to create a Layer 2 Ethernet connection between two customer sites. Providers can segregate different customers' VLAN traffic on a link (for example, if the customers use overlapping VLAN IDs) or bundle different customer VLANs into a single service VLAN. Data centers can use Q-in-Q tunneling and VLAN translation to isolate customer traffic within a single site or to enable customer traffic flows between cloud data centers in different geographic locations.

Q-in-Q tunneling adds a service VLAN tag before the customer's 802.1Q VLAN tags. The Juniper Networks Junos operating system implementation of Q-in-Q tunneling supports the IEEE 802.1ad standard.



**NOTE:** This task uses a Junos OS release that supports the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Configuring Q-in-Q Tunneling*.

With releases of Junos OS 13.2X51 previous to 13.2X51-D20, you cannot create a regular VLAN on an interface if you have created an S-VLAN or C-VLAN on that interface for Q-in-Q tunneling. This means that you cannot create an integrated routing and bridging (IRB) interface on that interface because regular VLANs are a required part of IRB configuration. With Junos OS 13.2X51-D25, you can create a regular VLAN on a trunk interface that has an S-VLAN, which means that you can also create an IRB interface on the trunk. In this case, the regular VLAN and S-VLAN on the same trunk interface cannot share the same VLAN ID. Junos OS 13.2X51-D25 does not allow you to create a regular VLAN on an access interface that has a C-VLAN.

Before setting up Q-in-Q tunneling, make sure you have created and configured the necessary customer VLANs on the neighboring switches. See *Configuring VLANs*.

- [Using the Different Mapping Methods on page 82](#)
- [Configuring All-in-One Bundling on page 83](#)
- [Configuring Many-to-Many Bundling on page 84](#)
- [Configuring a Specific Interface Mapping with VLAN ID Translation Option on page 87](#)

### Using the Different Mapping Methods

Once you have created the required VLANs on the neighboring switches, configure Q-in-Q tunneling using one of the three methods to map customer VLANs (C-VLANs) to service-provider-defined service VLANs (S-VLANs):

- All-in-one bundling maps all packets from all C-VLAN interfaces to an S-VLAN. For information about how to use this method, see [“Configuring All-in-One Bundling” on page 83](#).

- Use many-to-many bundling when you want a subset of the C-VLANs on the access switch to be part of multiple S-VLANs. For information about how to use this method, see [“Configuring Many-to-Many Bundling” on page 84](#).
- Use specific interface mapping when you want to assign an S-VLAN to a specific C-VLAN on an interface. For information about how to use this method, see [“Configuring a Specific Interface Mapping with VLAN ID Translation Option” on page 87](#).

## Configuring All-in-One Bundling

**Supported Platforms** EX4600, QFX Series standalone switches

You can configure Q-in-Q tunneling using the all-in-one bundling method, which forwards all packets that ingress on a C-VLAN interface to an S-VLAN. (Packets are forwarded to the S-VLAN regardless of whether they are tagged or untagged prior to ingress.) Using this approach saves you the effort of specifying a specific mapping for each C-VLAN.

First configure the S-VLAN and its interface:

1. Assign a logical interface (unit) to be a member of the S-VLAN.

```
[edit vlans vlan-name]
```

```
user@switch# interface interface-name.unit-number
```



**NOTE:** Do not use logical interface unit 0. You must later bind a VLAN tag ID to the unit you specify in this step, and you cannot bind a VLAN tag ID to unit 0. Also note that you do not create a VLAN ID for the S-VLAN. The ID is created automatically for the appropriate logical interface.

2. Enable the interface to transmit packets with two 802.1Q VLAN tags:

```
[edit interfaces interface-name]
```

```
user@switch# flexible-vlan-tagging
```

3. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
```

```
user@switch# encapsulation extended-vlan-bridge
```

4. Enable the S-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
```

```
user@switch# native-vlan-id vlan-id
```

5. Bind the logical interface (unit) of the interface that you specified in step 1 to the automatically-created VLAN ID for the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# vlan-id number
```

For example, the following configuration makes xe-0/0/0.10 a member of VLAN 10, enables Q-in-Q tunneling on interface xe-0/0/0, enables xe-0/0/0 to accept untagged packets, and binds the VLAN ID of S-VLAN v10 to a logical interface of xe-0/0/0.

```
set vlans v10 interface xe-0/0/0.10
```

```
set interfaces xe-0/0/0 flexible-vlan-tagging
```

```
set interfaces xe-0/0/0 native-vlan-id 10
```

```
set interfaces xe-0/0/0 encapsulation extended-vlan-bridge
```

```
set interfaces xe-0/0/0 unit 10 vlan-id 10
```

Now configure all-in-one bundling on a C-VLAN interface:

1. Assign a logical interface (unit) of the C-VLAN interface to be a member of the S-VLAN.

```
[edit vlans vlan-name]
```

```
user@switch# interface interface-name.unit-number
```

2. Enable the interface to transmit packets with 802.1Q VLAN tags :

```
[edit interfaces interface-name]
```

```
user@switch# flexible-vlan-tagging
```

3. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
```

```
user@switch# encapsulation extended-vlan-bridge
```

4. Enable the C-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
```

```
user@switch# native-vlan-id vlan-id
```

5. Configure a logical interface to receive and forward any tagged packet whose VLAN ID tag matches the list of VLAN IDs you specify:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# vlan-id-list vlan-id-numbers
```



**WARNING:** On some EX and QFX Series switches, you can apply no more than eight VLAN identifier lists to a physical interface.

6. Configure the system to add an S-VLAN tag (outer tag) as packets travel from a C-VLAN interface to the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# input-vlan-map push
```

7. Configure the system to remove the S-VLAN tag when packets are forwarded (internally) from the S-VLAN interface to the C-VLAN interface:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# output-vlan-map pop
```

For example, the following configuration makes xe-0/0/1.10 a member of S-VLAN v10, enables Q-in-Q tunneling, maps packets from C-VLANs 100 through 200 to S-VLAN 10, and enables xe-0/0/1 to accept untagged packets. If a packet originates in C-VLAN 100 and needs to be sent across the S-VLAN, a tag with VLAN ID 10 is added to the packet. When a packet is forwarded (internally) from the S-VLAN interface to interface xe-0/0/1, the tag with VLAN ID 10 is removed.

```
set vlans v10 interface xe-0/0/1.10
```

```
set interfaces xe-0/0/1 flexible-vlan-tagging
```

```
set interfaces xe-0/0/1 encapsulation extended-vlan-bridge
```

```
set interfaces xe-0/0/1 unit 10 vlan-id-list 100-200
```

```
set interfaces xe-0/0/1 native-vlan-id 150
```

```
set interfaces xe-0/0/1 unit 10 input-vlan-map push
```

```
set interfaces xe-0/0/1 unit 10 output-vlan-map pop
```

## Configuring Many-to-Many Bundling

**Supported Platforms** EX4600, QFX Series standalone switches

You can configure Q-in-Q tunneling using the many-to-many bundling method, which maps packets from multiple C-VLANs to multiple S-VLANs. This method is convenient for mapping a range of C-VLANs without having to specify each one individually. (You can also use this method to configure only one C-VLAN to be mapped to an S-VLAN.)

First configure the S-VLANs and assign them to an interface:

1. Assign a logical interface (unit) to be a member of one of the S-VLANs. Do not use logical interface unit 0.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```



**NOTE:** Note that you do not create a VLAN ID for the S-VLAN. The ID is created automatically for the appropriate logical interface.

2. Repeat step 1 for the other S-VLANs.
3. Enable the physical interface to transmit packets with two 802.1Q VLAN tags:

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

5. Enable the S-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

6. Bind one of the logical units of the interface to the VLAN ID for one of the S-VLANs.

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

7. Repeat step 6 to bind the automatically-created VLAN IDs for the other S-VLANs to the other logical units of the interface:

For example, the following configuration creates S-VLANs v10 and v30 and associates them with interface xe-0/0/0. It also enables Q-in-Q tunneling, enables xe-0/0/0 to accept untagged packets, and maps incoming C-VLAN packets to S-VLANs v10 and v30.

```
set vlans v10 interface xe-0/0/0.10
set vlans v30 interface xe-0/0/0.30
set interfaces xe-0/0/0 flexible-vlan-tagging
set interfaces xe-0/0/0 native-vlan-id 10
set interfaces xe-0/0/0 encapsulation extended-vlan-bridge
set interfaces xe-0/0/0 unit 10 vlan-id 10
set interfaces xe-0/0/0 unit 30 vlan-id 30
```

To configure the many-to-many bundling method on a C-VLAN interface, perform the following steps for each customer:

1. Assign a logical interface (unit) of one C-VLAN interface to be a member of one S-VLAN.

```
[edit vlans vlan-name]
```

```
user@switch# interface interface-name.unit-number
```

2. Repeat step 1 to assign another C-VLAN interface (physical interface) to be a member of another S-VLAN.

3. Enable the interface to transmit packets with 802.1Q VLAN tags:

```
[edit interfaces interface-name]
```

```
user@switch# flexible-vlan-tagging
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
```

```
user@switch# encapsulation extended-vlan-bridge
```

5. Enable the C-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
```

```
user@switch# native-vlan-id vlan-id
```

6. For each physical interface, configure a logical interface (unit) to receive and forward any tagged packet whose VLAN ID tag matches the list of VLAN IDs you specify:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# vlan-id-list vlan-id-numbers
```

To configure only one C-VLAN to be mapped to an S-VLAN, specify only one VLAN ID after *vlan-id-list*.



**WARNING:** On some EX and QFX Series switches, you can apply no more than eight VLAN identifier list to a physical interface.

7. For each physical interface, configure the system to add an S-VLAN tag (outer tag) as packets travel from the C-VLAN interface to the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# input-vlan-map push
```

8. For each physical interface, configure the system to remove the S-VLAN tag when packets are forwarded from the S-VLAN interface to the C-VLAN interface:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# output-vlan-map pop
```

For example, the following configuration makes xe-0/0/1.10 a member of S-VLAN v10, enables Q-in-Q tunneling, and maps packets from C-VLANs 10 through 20 to S-VLAN 10. The configuration for customer 2 makes xe-0/0/2.30 a member of S-VLAN v30, enables Q-in-Q tunneling, and maps packets from C-VLANs 30 through 40, 50 through 60, and 70 through 80 to S-VLAN 30. Both interfaces are configured to accept untagged packets.

If a packet originates in C-VLAN 10 and needs to be sent over the S-VLAN, a tag with a VLAN ID 10 is added to the packet. If a packet is forwarded internally from the S-VLAN interface to xe-0/0/1.10, the tag with VLAN ID 10 is removed. The same principles apply to the C-VLANs configured on interface xe-0/0/2.





**NOTE:** Notice that you can use the same tag value for an S-VLAN and C-VLAN. For example, the configuration for customer 1 maps C-VLAN ID 10 to S-VLAN ID 10. C-VLAN and S-VLAN tags use separate name spaces, so this configuration is allowed.

Configuration for customer 1:

```
set vlans v10 interface xe-0/0/1.10
set interfaces xe-0/0/1 flexible-vlan-tagging
set interfaces xe-0/0/1 encapsulation extended-vlan-bridge
set interfaces xe-0/0/1 unit 10 vlan-id-list 10-20
set interfaces xe-0/0/1 native-vlan-id 15
set interfaces xe-0/0/1 unit 10 input-vlan-map push
set interfaces xe-0/0/1 unit 10 output-vlan-map pop
```

Configuration for customer 2:

```
set vlans v30 interface xe-0/0/2.30
set interfaces xe-0/0/2 flexible-vlan-tagging
set interfaces xe-0/0/2 encapsulation extended-vlan-bridge
set interfaces xe-0/0/2 unit 30 vlan-id-list 30-40
set interfaces xe-0/0/2 unit 30 vlan-id-list 50-60
set interfaces xe-0/0/2 unit 30 vlan-id-list 70-80
set interfaces xe-0/0/2 native-vlan-id 75
set interfaces xe-0/0/2 unit 30 input-vlan-map push
set interfaces xe-0/0/2 unit 30 output-vlan-map pop
```

## Configuring a Specific Interface Mapping with VLAN ID Translation Option

**Supported Platforms** EX4600, QFX Series standalone switches

You can configure Q-in-Q tunneling by mapping packets from a specified C-VLAN to a specified S-VLAN. In addition, you can configure the system to replace a C-VLAN tag with an S-VLAN tag or replace an S-VLAN tag with a C-VLAN tag (instead of double tagging). This is called VLAN translation or VLAN rewriting. VLAN translation is particularly useful if a service provider's Layer 2 network that connects a customer's sites does not support double tagged packets.

When you use VLAN translation, both ends of the link normally must be able to swap the tags appropriately. That is, both ends of the link must be configured to swap the C-VLAN tag for the S-VLAN tag and swap the S-VLAN tag for the C-VLAN tag so that traffic in both directions is tagged appropriately while in transit and after arrival.

First configure the S-VLAN and its interface:

1. Assign a logical interface to be a member of the S-VLAN. Do not use unit 0.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```



**NOTE:** Note that you do not create a VLAN ID for the S-VLAN. The ID is created automatically for the appropriate logical interface.

2. Enable the interface to transmit packets with 802.1Q VLAN tags:

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

3. Enable the S-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

5. Bind the logical interface (unit) of the interface that you specified earlier to the VLAN ID for the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

For example, the following configuration creates S-VLAN v200, makes xe-0/0/0.200 a member of that VLAN, enables Q-in-Q tunneling on interface xe-0/0/0, enables xe-0/0/0 to accept untagged packets, and binds a logical interface of xe-0/0/0 to the VLAN ID of VLAN v200.

```
set vlans v200 interface xe-0/0/0.200
set interfaces xe-0/0/0 flexible-vlan-tagging
set interfaces xe-0/0/0 native-vlan-id 10
set interfaces xe-0/0/0 encapsulation extended-vlan-bridge
set interfaces xe-0/0/0 unit 200 vlan-id 200
```

Now configure a specific interface mapping with optional VLAN ID translation on the C-VLAN interface:

1. Assign a logical interface of the C-VLAN interface to be a member of the S-VLAN.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```

2. Enable the interface to transmit packets with 802.1Q VLAN tags:

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

3. Enable the C-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

5. Configure a logical interface (unit) to receive and forward any tagged packet whose VLAN ID tag matches the VLAN IDs you specify:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

6. Configure the system to remove the existing C-VLAN tag and replace it with the S-VLAN tag when packets ingress on the C-VLAN interface and are forwarded to the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# input-vlan-map swap
```

7. Configure the system to remove the existing S-VLAN tag and replace it with the C-VLAN tag when packets are forwarded from the S-VLAN interface to the C-VLAN interface:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# output-vlan-map swap
```

8. To configure an S-VLAN and associate it with the appropriate C-VLAN interface:

```
[edit vlans vlan-name]
user@switch# interface interface-name
```

For example, the following configuration on C-VLAN interface xe-0/0/1 enables Q-in-Q tunneling, enables xe-0/0/1 to accept untagged packets, and maps incoming packets from C-VLAN 150 to logical interface 200, which is a member of S-VLAN 200. Also, when packets egress from C-VLAN interface xe-0/0/1 and travel to the S-VLAN interface, the C-VLAN tag of 150 is removed and replaced with the S-VLAN tag of 200. When packets travel from the S-VLAN interface to the C-VLAN interface, the S-VLAN tag of 200 is removed and replaced with the C-VLAN tag of 150.

```
set vlans v200 interface xe-0/0/1.200
set interfaces xe-0/0/1 flexible-vlan-tagging
set interfaces xe-0/0/1 native-vlan-id 10
set interfaces xe-0/0/1 encapsulation extended-vlan-bridge
set interfaces xe-0/0/1 unit 200 vlan-id 150
set interfaces xe-0/0/1 unit 200 output-vlan-map swap
set interfaces xe-0/0/1 unit 200 input-vlan-map swap
```

#### Related Documentation

- [Understanding Q-in-Q Tunneling on page 77](#)

## Configuring All-in-One Bundling

**Supported Platforms** [EX4600, QFX Series standalone switches](#)

You can configure Q-in-Q tunneling using the all-in-one bundling method, which forwards all packets that ingress on a C-VLAN interface to an S-VLAN. (Packets are forwarded to the S-VLAN regardless of whether they are tagged or untagged prior to ingress.) Using this approach saves you the effort of specifying a specific mapping for each C-VLAN.

First configure the S-VLAN and its interface:

1. Assign a logical interface (unit) to be a member of the S-VLAN.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```



**NOTE:** Do not use logical interface unit 0. You must later bind a VLAN tag ID to the unit you specify in this step, and you cannot bind a VLAN tag ID to unit 0. Also note that you do not create a VLAN ID for the S-VLAN. The ID is created automatically for the appropriate logical interface.

2. Enable the interface to transmit packets with two 802.1Q VLAN tags:

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

3. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

4. Enable the S-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

5. Bind the logical interface (unit) of the interface that you specified in step 1 to the automatically-created VLAN ID for the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

For example, the following configuration makes xe-0/0/0.10 a member of VLAN 10, enables Q-in-Q tunneling on interface xe-0/0/0, enables xe-0/0/0 to accept untagged packets, and binds the VLAN ID of S-VLAN v10 to a logical interface of xe-0/0/0.

```
set vlans v10 interface xe-0/0/0.10
set interfaces xe-0/0/0 flexible-vlan-tagging
set interfaces xe-0/0/0 native-vlan-id 10
set interfaces xe-0/0/0 encapsulation extended-vlan-bridge
set interfaces xe-0/0/0 unit 10 vlan-id 10
```

Now configure all-in-one bundling on a C-VLAN interface:

1. Assign a logical interface (unit) of the C-VLAN interface to be a member of the S-VLAN.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```

2. Enable the interface to transmit packets with 802.1Q VLAN tags :

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

3. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

4. Enable the C-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

5. Configure a logical interface to receive and forward any tagged packet whose VLAN ID tag matches the list of VLAN IDs you specify:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id-list vlan-id-numbers
```



**WARNING:** On some EX and QFX Series switches, you can apply no more than eight VLAN identifier lists to a physical interface.

6. Configure the system to add an S-VLAN tag (outer tag) as packets travel from a C-VLAN interface to the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# input-vlan-map push
```

7. Configure the system to remove the S-VLAN tag when packets are forwarded (internally) from the S-VLAN interface to the C-VLAN interface:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# output-vlan-map pop
```

For example, the following configuration makes xe-0/0/1.10 a member of S-VLAN v10, enables Q-in-Q tunneling, maps packets from C-VLANs 100 through 200 to S-VLAN 10, and enables xe-0/0/1 to accept untagged packets. If a packet originates in C-VLAN 100 and needs to be sent across the S-VLAN, a tag with VLAN ID 10 is added to the packet. When a packet is forwarded (internally) from the S-VLAN interface to interface xe-0/0/1, the tag with VLAN ID 10 is removed.

```
set vlans v10 interface xe-0/0/1.10
set interfaces xe-0/0/1 flexible-vlan-tagging
set interfaces xe-0/0/1 encapsulation extended-vlan-bridge
set interfaces xe-0/0/1 unit 10 vlan-id-list 100-200
set interfaces xe-0/0/1 native-vlan-id 150
set interfaces xe-0/0/1 unit 10 input-vlan-map push
set interfaces xe-0/0/1 unit 10 output-vlan-map pop
```

#### Related Documentation

- [Understanding Q-in-Q Tunneling on page 77](#)
- [Configuring Many-to-Many Bundling on page 84](#)
- [Configuring a Specific Interface Mapping with VLAN ID Translation Option on page 87](#)

## Configuring Many-to-Many Bundling

**Supported Platforms** EX4600, QFX Series standalone switches

You can configure Q-in-Q tunneling using the many-to-many bundling method, which maps packets from multiple C-VLANs to multiple S-VLANs. This method is convenient for mapping a range of C-VLANs without having to specify each one individually. (You can also use this method to configure only one C-VLAN to be mapped to an S-VLAN.)

First configure the S-VLANs and assign them to an interface:

1. Assign a logical interface (unit) to be a member of one of the S-VLANs. Do not use logical interface unit 0.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```



**NOTE:** Note that you do not create a VLAN ID for the S-VLAN. The ID is created automatically for the appropriate logical interface.

2. Repeat step 1 for the other S-VLANs.
3. Enable the physical interface to transmit packets with two 802.1Q VLAN tags:

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

5. Enable the S-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

6. Bind one of the logical units of the interface to the VLAN ID for one of the S-VLANs.

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

7. Repeat step 6 to bind the automatically-created VLAN IDs for the other S-VLANs to the other logical units of the interface:

For example, the following configuration creates S-VLANs v10 and v30 and associates them with interface xe-0/0/0. It also enables Q-in-Q tunneling, enables xe-0/0/0 to accept untagged packets, and maps incoming C-VLAN packets to S-VLANs v10 and v30.

```
set vlans v10 interface xe-0/0/0.10
set vlans v30 interface xe-0/0/0.30
set interfaces xe-0/0/0 flexible-vlan-tagging
set interfaces xe-0/0/0 native-vlan-id 10
set interfaces xe-0/0/0 encapsulation extended-vlan-bridge
set interfaces xe-0/0/0 unit 10 vlan-id 10
set interfaces xe-0/0/0 unit 30 vlan-id 30
```

To configure the many-to-many bundling method on a C-VLAN interface, perform the following steps for each customer:

1. Assign a logical interface (unit) of one C-VLAN interface to be a member of one S-VLAN.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```

2. Repeat step 1 to assign another C-VLAN interface (physical interface) to be a member of another S-VLAN.

3. Enable the interface to transmit packets with 802.1Q VLAN tags:

```
[edit interfaces interface-name]
```

```
user@switch# flexible-vlan-tagging
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
```

```
user@switch# encapsulation extended-vlan-bridge
```

5. Enable the C-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
```

```
user@switch# native-vlan-id vlan-id
```

6. For each physical interface, configure a logical interface (unit) to receive and forward any tagged packet whose VLAN ID tag matches the list of VLAN IDs you specify:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# vlan-id-list vlan-id-numbers
```

To configure only one C-VLAN to be mapped to an S-VLAN, specify only one VLAN ID after *vlan-id-list*.



**WARNING:** On some EX and QFX Series switches, you can apply no more than eight VLAN identifier list to a physical interface.

7. For each physical interface, configure the system to add an S-VLAN tag (outer tag) as packets travel from the C-VLAN interface to the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# input-vlan-map push
```

8. For each physical interface, configure the system to remove the S-VLAN tag when packets are forwarded from the S-VLAN interface to the C-VLAN interface:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
user@switch# output-vlan-map pop
```

For example, the following configuration makes xe-0/0/1.10 a member of S-VLAN v10, enables Q-in-Q tunneling, and maps packets from C-VLANs 10 through 20 to S-VLAN 10. The configuration for customer 2 makes xe-0/0/2.30 a member of S-VLAN v30, enables Q-in-Q tunneling, and maps packets from C-VLANs 30 through 40, 50 through 60, and 70 through 80 to S-VLAN 30. Both interfaces are configured to accept untagged packets.

If a packet originates in C-VLAN 10 and needs to be sent over the S-VLAN, a tag with a VLAN ID 10 is added to the packet. If a packet is forwarded internally from the S-VLAN interface to xe-0/0/1.10, the tag with VLAN ID 10 is removed. The same principles apply to the C-VLANs configured on interface xe-0/0/2.



**NOTE:** Notice that you can use the same tag value for an S-VLAN and C-VLAN. For example, the configuration for customer 1 maps C-VLAN ID 10 to S-VLAN ID 10. C-VLAN and S-VLAN tags use separate name spaces, so this configuration is allowed.

Configuration for customer 1:

```
set vlans v10 interface xe-0/0/1.10
```

```
set interfaces xe-0/0/1 flexible-vlan-tagging
```

```

set interfaces xe-0/0/1 encapsulation extended-vlan-bridge
set interfaces xe-0/0/1 unit 10 vlan-id-list 10-20
set interfaces xe-0/0/1 native-vlan-id 15
set interfaces xe-0/0/1 unit 10 input-vlan-map push
set interfaces xe-0/0/1 unit 10 output-vlan-map pop

```

Configuration for customer 2:

```

set vlans v30 interface xe-0/0/2.30
set interfaces xe-0/0/2 flexible-vlan-tagging
set interfaces xe-0/0/2 encapsulation extended-vlan-bridge
set interfaces xe-0/0/2 unit 30 vlan-id-list 30-40
set interfaces xe-0/0/2 unit 30 vlan-id-list 50-60
set interfaces xe-0/0/2 unit 30 vlan-id-list 70-80
set interfaces xe-0/0/2 native-vlan-id 75
set interfaces xe-0/0/2 unit 30 input-vlan-map push
set interfaces xe-0/0/2 unit 30 output-vlan-map pop

```

#### Related Documentation

- [Understanding Q-in-Q Tunneling on page 77](#)
- [Configuring All-in-One Bundling on page 83](#)
- [Configuring a Specific Interface Mapping with VLAN ID Translation Option on page 87](#)

## Configuring a Specific Interface Mapping with VLAN ID Translation Option

**Supported Platforms** EX4600, QFX Series standalone switches

You can configure Q-in-Q tunneling by mapping packets from a specified C-VLAN to a specified S-VLAN. In addition, you can configure the system to replace a C-VLAN tag with an S-VLAN tag or replace an S-VLAN tag with a C-VLAN tag (instead of double tagging). This is called VLAN translation or VLAN rewriting. VLAN translation is particularly useful if a service provider's Layer 2 network that connects a customer's sites does not support double tagged packets.

When you use VLAN translation, both ends of the link normally must be able to swap the tags appropriately. That is, both ends of the link must be configured to swap the C-VLAN tag for the S-VLAN tag and swap the S-VLAN tag for the C-VLAN tag so that traffic in both directions is tagged appropriately while in transit and after arrival.

First configure the S-VLAN and its interface:

1. Assign a logical interface to be a member of the S-VLAN. Do not use unit 0.

**[edit vlans *vlan-name*]**

user@switch# **interface *interface-name.unit-number***



**NOTE:** Note that you do not create a VLAN ID for the S-VLAN. The ID is created automatically for the appropriate logical interface.

2. Enable the interface to transmit packets with 802.1Q VLAN tags:

**[edit interfaces *interface-name*]**

user@switch# **flexible-vlan-tagging**

3. Enable the S-VLAN interface to send and receive untagged packets:



```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

5. Bind the logical interface (unit) of the interface that you specified earlier to the VLAN ID for the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

For example, the following configuration creates S-VLAN v200, makes xe-0/0/0.200 a member of that VLAN, enables Q-in-Q tunneling on interface xe-0/0/0, enables xe-0/0/0 to accept untagged packets, and binds a logical interface of xe-0/0/0 to the VLAN ID of VLAN v200.

```
set vlans v200 interface xe-0/0/0.200
set interfaces xe-0/0/0 flexible-vlan-tagging
set interfaces xe-0/0/0 native-vlan-id 10
set interfaces xe-0/0/0 encapsulation extended-vlan-bridge
set interfaces xe-0/0/0 unit 200 vlan-id 200
```

Now configure a specific interface mapping with optional VLAN ID translation on the C-VLAN interface:

1. Assign a logical interface of the C-VLAN interface to be a member of the S-VLAN.

```
[edit vlans vlan-name]
user@switch# interface interface-name.unit-number
```

2. Enable the interface to transmit packets with 802.1Q VLAN tags:

```
[edit interfaces interface-name]
user@switch# flexible-vlan-tagging
```

3. Enable the C-VLAN interface to send and receive untagged packets:

```
[edit interfaces interface-name]
user@switch# native-vlan-id vlan-id
```

4. Enable extended VLAN bridge encapsulation on the interface:

```
[edit interfaces interface-name]
user@switch# encapsulation extended-vlan-bridge
```

5. Configure a logical interface (unit) to receive and forward any tagged packet whose VLAN ID tag matches the VLAN IDs you specify:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# vlan-id number
```

6. Configure the system to remove the existing C-VLAN tag and replace it with the S-VLAN tag when packets ingress on the C-VLAN interface and are forwarded to the S-VLAN:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# input-vlan-map swap
```

7. Configure the system to remove the existing S-VLAN tag and replace it with the C-VLAN tag when packets are forwarded from the S-VLAN interface to the C-VLAN interface:

```
[edit interfaces interface-name unit logical-unit-number]
user@switch# output-vlan-map swap
```

8. To configure an S-VLAN and associate it with the appropriate C-VLAN interface:

**[edit vlans *vlan-name*]**

**user@switch# interface *interface-name***

For example, the following configuration on C-VLAN interface xe-0/0/1 enables Q-in-Q tunneling, enables xe-0/0/1 to accept untagged packets, and maps incoming packets from C-VLAN 150 to logical interface 200, which is a member of S-VLAN 200. Also, when packets egress from C-VLAN interface xe-0/0/1 and travel to the S-VLAN interface, the C-VLAN tag of 150 is removed and replaced with the S-VLAN tag of 200. When packets travel from the S-VLAN interface to the C-VLAN interface, the S-VLAN tag of 200 is removed and replaced with the C-VLAN tag of 150.

```
set vlans v200 interface xe-0/0/1.200
set interfaces xe-0/0/1 flexible-vlan-tagging
set interfaces xe-0/0/1 native-vlan-id 10
set interfaces xe-0/0/1 encapsulation extended-vlan-bridge
set interfaces xe-0/0/1 unit 200 vlan-id 150
set interfaces xe-0/0/1 unit 200 output-vlan-map swap
set interfaces xe-0/0/1 unit 200 input-vlan-map swap
```

**Related  
Documentation**

- [Understanding Q-in-Q Tunneling on page 77](#)
- [Configuring All-in-One Bundling on page 83](#)
- [Configuring Many-to-Many Bundling on page 84](#)

## PART 5

# Proxy ARP

- [Using Proxy ARP on page 99](#)



## CHAPTER 5

# Using Proxy ARP

- [Understanding Proxy ARP on page 99](#)
- [Configuring Proxy ARP \(CLI Procedure\) on page 100](#)
- [Verifying That Proxy ARP Is Working Correctly on page 101](#)

## Understanding Proxy ARP

---

**Supported Platforms** [EX4600, QFabric System, QFX Series standalone switches](#)

You can configure proxy Address Resolution Protocol (ARP) to enable the switch to respond to ARP queries for network addresses by offering its own Ethernet media access control (MAC) address. With proxy ARP enabled, the switch captures and routes traffic to the intended destination.

Proxy ARP is useful in situations where hosts are on different physical networks and you do not want to use subnet masking. Because ARP broadcasts are not propagated between hosts on different physical networks, hosts will not receive a response to their ARP request if the destination is on a different subnet. Enabling the switch to act as an ARP proxy allows the hosts to transparently communicate with each other through the switch. Proxy ARP can help hosts on a subnet reach remote subnets without your having to configure routing or a default gateway.

- [What Is ARP? on page 99](#)
- [Proxy ARP Overview on page 99](#)
- [Best Practices for Proxy ARP on page 100](#)

## What Is ARP?

Ethernet LANs use ARP to map Ethernet MAC addresses to IP addresses. Each device maintains a cache containing a mapping of MAC addresses to IP addresses. The switch maintains this mapping in a cache that it consults when forwarding packets to network devices. If the ARP cache does not contain an entry for the destination device, the host (the DHCP client) broadcasts an ARP request for that device's address and stores the response in the cache.

## Proxy ARP Overview

When proxy ARP is enabled, if the switch receives an ARP request for which it has a route to the target (destination) IP address, the switch responds by sending a proxy ARP reply

packet containing its own MAC address. The host that sent the ARP request then sends its packets to the switch, which forwards them to the intended host.



**NOTE:** For security reasons, the source address in an ARP request must be on the same subnet as the interface on which the ARP request is received.

You can configure proxy ARP for each interface. You can also configure proxy ARP for a VLAN by using a routed VLAN interface (RVI).

Two modes of proxy ARP are supported: restricted and unrestricted. Both modes require that the switch have an active route to the destination address of the ARP request.

- **Restricted**—The switch responds to ARP requests in which the physical networks of the source and target are different and does not respond if the source and target IP addresses are on the same subnet. In this mode, hosts on the same subnet communicate without proxy ARP. We recommend that you use this mode on the switch.
- **Unrestricted**—The switch responds to all ARP requests for which it has a route to the destination. This is the default mode (because it is the default mode in Juniper Networks Junos operating system (Junos OS) configurations other than those on the switch). We recommend using restricted mode on the switch.

## Best Practices for Proxy ARP

We recommend these best practices for configuring proxy ARP on the switches:

- Set proxy ARP to restricted mode.
- Use restricted mode when configuring proxy ARP on RVIs.
- If you set proxy ARP to unrestricted, disable gratuitous ARP requests on each interface enabled for proxy ARP.

**Related Documentation**

- *Configuring Proxy ARP*
- *proxy-arp*

---

## Configuring Proxy ARP (CLI Procedure)

**Supported Platforms**   [EX Series, QFX Series standalone switches](#)



**NOTE:** This task uses Junos OS for EX Series switches and QFX3500 and QFX3600 switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Configuring Proxy ARP (CLI Procedure)* or *Configuring Proxy ARP*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

You can configure proxy Address Resolution Protocol (ARP) on your switch to enable the switch to respond to ARP queries for network addresses by offering its own media access control (MAC) address. With proxy ARP enabled, the switch captures and routes traffic to the intended destination.

To configure proxy ARP on a single interface:

```
[edit interfaces]
user@switch# set interface-name unit logical-unit-number proxy-arp (restricted |
unrestricted)
```



**BEST PRACTICE:** We recommend that you configure proxy ARP in restricted mode. In restricted mode, the switch does not act as a proxy if the source and target IP addresses are on the same subnet. If you decide to use unrestricted mode, disable gratuitous ARP requests on the interface to avoid a situation wherein the switch's response to a gratuitous ARP request appears to the host to be an indication of an IP conflict.

To configure proxy ARP on an integrated routing and bridging (IRB) interface:

```
[edit interfaces]
user@switch# set irb.logical-unit-number proxy-arp restricted
```

#### Related Documentation

- [Example: Configuring Proxy ARP on an EX Series Switch](#)
- [Verifying That Proxy ARP Is Working Correctly on page 101](#)
- [Configuring Integrated Routing and Bridging Interfaces \(CLI Procedure\)](#)

## Verifying That Proxy ARP Is Working Correctly

**Supported Platforms** EX Series, QFX Series standalone switches

**Purpose** Verify that the switch is sending proxy ARP messages.

**Action** List the system statistics for ARP:

```
user@switch> show system statistics arp
arp:
 90060 datagrams received
 34 ARP requests received
 610 ARP replies received
 2 resolution request received
 0 unrestricted proxy requests
 0 restricted proxy requests
 0 received proxy requests
```

```
0 unrestricted proxy requests not proxied
0 restricted proxy requests not proxied
0 datagrams with bogus interface
0 datagrams with incorrect length
0 datagrams for non-IP protocol
0 datagrams with unsupported op code
0 datagrams with bad protocol address length
0 datagrams with bad hardware address length
0 datagrams with multicast source address
0 datagrams with multicast target address
0 datagrams with my own hardware address
0 datagrams for an address not on the interface
0 datagrams with a broadcast source address
294 datagrams with source address duplicate to mine
89113 datagrams which were not for me
0 packets discarded waiting for resolution
0 packets sent after waiting for resolution
309 ARP requests sent
35 ARP replies sent
0 requests for memory denied
0 requests dropped on entry
0 requests dropped during retry
0 requests dropped due to interface deletion
0 requests on unnumbered interfaces
0 new requests on unnumbered interfaces
0 replies for from unnumbered interfaces
0 requests on unnumbered interface with non-subnetted donor
0 replies from unnumbered interface with non-subnetted donor
```

**Meaning** The statistics show that two proxy ARP requests were received. The **unrestricted proxy requests not proxied** and **restricted proxy requests not proxied** fields indicate that all the unproxied ARP requests received have been proxied by the switch.

**Related Documentation**

- [Configuring Proxy ARP](#)
- [Configuring Proxy ARP \(CLI Procedure\) on page 100](#)



## PART 6

# Configuration Statements and Operational Commands

- [VLAN Configuration Statements on page 105](#)
- [MAC Address Configuration Statements on page 149](#)
- [STP Configuration Statements on page 157](#)
- [Q-in-Q Configuration Statements on page 199](#)
- [Bridging and VLANs Monitoring Commands on page 209](#)
- [MAC Address Operational Commands on page 235](#)
- [Spanning Tree Monitoring Commands on page 247](#)



## CHAPTER 6

# VLAN Configuration Statements

- [\[edit vlans\] Configuration Statement Hierarchy on the QFX Series on page 105](#)
- [description \(VLAN\) on page 109](#)
- [dhcp-relay on page 110](#)
- [filter \(VLANs\) on page 115](#)
- [forwarding-options on page 116](#)
- [interface \(VLANs\) on page 121](#)
- [interface-mac-limit on page 122](#)
- [interface-mode on page 124](#)
- [irb \(Interfaces\) on page 126](#)
- [l3-interface \(VLAN\) on page 129](#)
- [mac \(Static MAC-Based VLANs\) on page 130](#)
- [members on page 131](#)
- [native-vlan-id on page 132](#)
- [packet-action on page 133](#)
- [port-mode on page 136](#)
- [service-id on page 137](#)
- [switch-options on page 138](#)
- [static \(Static MAC-Based VLANs\) on page 139](#)
- [static-mac on page 139](#)
- [vlan-id \(VLANs\) on page 140](#)
- [vlan-id-list on page 141](#)
- [vlan-rewrite on page 142](#)
- [vlan-tagging on page 143](#)
- [vlan-tags on page 144](#)
- [vlans on page 145](#)

---

### [\[edit vlans\] Configuration Statement Hierarchy on the QFX Series](#)

**Supported Platforms**    EX4600, QFX Series standalone switches

This topic lists supported and unsupported configuration statements in the **[edit vlans]** 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.

This topic lists:

- [Supported Statements in the \[edit vlans\] Hierarchy Level on page 106](#)
- [Unsupported Statements in the \[edit vlans\] Hierarchy Level on page 108](#)

## Supported Statements in the [edit vlans] Hierarchy Level

The following hierarchy shows the **[edit vlans]** configuration statements supported on one or more of the EX Series switches:

```
vlan {
 vlan-name {
 description text-description;
 domain-type bridge;
 forwarding-options {
 dhcp-security {
 arp-inspection;
 group group-name {
 interface interface-name {
 static-ip ip-address {
 mac mac-address;
 }
 }
 }
 overrides {
 no-option82;
 trusted;
 }
 }
 }
 ip-source-guard;
 no-dhcp-snooping;
 option-82 {
 circuit-id {
 prefix {
 host-name;
 logical-system-name;
 routing-instance-name;
 }
 use-interface-description (device | logical);
 use-vlan-id;
 }
 }
 remote-id {
 host-name;
 use-interface-description (device | logical);
 use-string string;
 }
 vendor-id {
```

```

 use-string string;
 }
}
filter {
 input filter-name;
 output filter-name;
}
flood {
 input filter-name;
}
}
l3-interface irb.logical-unit-number;
multicast-snooping-options {
 flood-groups [group-names];
 forwarding-cache {
 threshold {
 reuse threshold;
 suppress threshold;
 }
 }
 graceful-restart {
 disable;
 restart-duration duration;
 }
 host-outbound-traffic {
 dot1p bits;
 forwarding-class forwarding-class;
 }
 multichassis-lag-replicate-state;
 nexthop-hold-time time;
 options {
 syslog {
 level level;
 mark interval;
 upto level;
 }
 }
}
traceoptions {
 file filename {
 files number;
 no-world-readable;
 size file-size;
 world-readable;
 }
 flag flag {
 disable;
 }
}
}
switch-options {
 interface interface-name {
 interface-mac-limit limit {
 packet-action action;
 }
 static-mac mac-address;
 }
}

```

```

 }
 interface-mac-limit limit {
 packet-action action;
 }
 mac-move-limit limit {
 packet-action action;
 }
 mac-table-size limit {
 packet-action drop;
 }
 no-mac-learning;
}
vlan-id number;
vlan-id-list [vlan-id | vlan-id-vlan-id];
}

```

### Unsupported Statements in the [edit vlans] Hierarchy Level

All statements in the **[edit vlans]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented with the following exceptions:

**Table 8: Unsupported [edit vlans] Configuration Statements on EX Series Switches**

| Statement                                                                                         | Hierarchy Level |
|---------------------------------------------------------------------------------------------------|-----------------|
| <i>NOTE:</i> Variables, such as <i>filename</i> , are not shown in the statements or hierarchies. |                 |
| mcae-mac-synchronize                                                                              | [edit vlans]    |
| no-irb-layer-2-copy                                                                               | [edit vlans]    |

**Related Documentation**

- [Understanding Bridging and VLANs on page 7](#)

---

## description (VLAN)

---

**Supported Platforms** [EX4600, QFX Series](#)

**Syntax** `description text-description;`

**Hierarchy Level** [edit vlans *vlan-name*]

**Release Information** Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Provide a textual description for the VLAN. The text has no effect on the operation of the VLAN or switch.

**Options** *text-description*—Text to describe the interface. It can contain letters, numbers, and hyphens (-) and can be up to 255 characters long. If the text includes spaces, enclose the entire text in quotation marks.

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

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

**Related Documentation**

- *Example: Setting Up Basic Bridging and a VLAN on the QFX Series*
- [Understanding Bridging and VLANs on page 7](#)
- [show vlans on page 225](#)

## dhcp-relay

Supported Platforms [EX4600, QFX Series](#)

```
Syntax dhcp-relay {
 active-server-group server-group-name;
 authentication {
 password password-string;
 username-include {
 circuit-type;
 delimiter delimiter-character;
 domain-name domain-name-string;
 interface-name;
 logical-system-name;
 mac-address;
 option-60;
 option-82 <circuit-id> <remote-id>;
 routing-instance-name;
 user-prefix user-prefix-string;
 }
 }
 }
 dhcpv6 {
 active-server-group server-group-name;
 authentication {
 password password-string;
 username-include {
 circuit-type;
 client-id;
 delimiter delimiter-character;
 domain-name domain-name-string;
 interface-name;
 logical-system-name;
 relay-agent-interface-id;
 relay-agent-remote-id;
 relay-agent-subscriber-id;
 routing-instance-name;
 user-prefix user-prefix-string;
 }
 }
 dynamic-profile profile-name {
 aggregate-clients (merge | replace);
 use-primary primary-profile-name;
 }
 }
}
group group-name {
 active-server-group server-group-name;
 authentication {
 ...
 }
 dynamic-profile profile-name {
 ...
 }
 interface interface-name {
 exclude;
 liveness-detection {
```



```

failure-action (clear-binding | clear-binding-if-interface-up | log-only);
method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
}
}
overrides {
 ...
}
service-profile dynamic-profile-name;
trace;
upto upto-interface-name;
}
service-profile dynamic-profile-name;
}
overrides {
 ...
}
relay-agent-interface-id {
 ...
}
}
service-profile dynamic-profile-name;
liveness-detection {
 failure-action (clear-binding | clear-binding-if-interface-up | log-only);
 method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
 }
}
}

```

```

}
overrides {
 allow-snooped-clients;
 interface-client-limit number;
 no-allow-snooped-clients;
 no-bind-on-request;
 send-release-on-delete;
}
relay-agent-interface-id {
 prefix prefix;
 use-interface-description (logical | device);
}
server-group {
 server-group-name {
 server-ip-address;
 }
}
dynamic-profile profile-name {
 aggregate-clients (merge | replace);
 use-primary primary-profile-name;
}
forward-snooped-clients (all-interfaces | configured-interfaces |
 non-configured-interfaces);
group group-name {
 active-server-group server-group-name;
 authentication {
 ...
 }
}
dynamic-profile profile-name {
 ...
}
interface interface-name {
 exclude;
 liveness-detection {
 failure-action (clear-binding | clear-binding-if-interface-up | log-only);
 method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
 }
 }
}
overrides {
 ...
}

```

```

 }
 service-profile dynamic-profile-name;
 trace;
 upto upto-interface-name;
 }
 overrides {
 ...
 }
 relay-option-82 {
 ...
 }
 service-profile dynamic-profile-name;
}
liveness-detection {
 failure-action (clear-binding | clear-binding-if-interface-up | log-only);
 method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
}
}
overrides {
 allow-snooped-clients;
 always-write-giaddr;
 always-write-option-82;
 client-discover-match <option60-and-option82>;
 disable-relay;
 interface-client-limit number;
 layer2-unicast-replies;
 no-allow-snooped-clients;
 no-bind-on-request;
 proxy-mode;
 replace-ip-source-with;
 send-release-on-delete;
 trust-option-82;
}
relay-option-82 {
 circuit-id {
 prefix prefix;
 use-interface-description (logical | device);
 }
}
}
server-group {

```

```
server-group-name {
 server-ip-address;
}
}
service-profile dynamic-profile-name;
}
```

**Hierarchy Level** [edit forwarding-options],  
[edit vlans forwarding-options]

**Release Information** Statement introduced in Junos OS Release 11.3 for the QFX Series.

**Description** Configure extended Dynamic Host Configuration Protocol (DHCP) relay and DHCPv6 relay options on the switch and enable the switch to function as a DHCP relay agent. A DHCP relay agent forwards DHCP request and reply packets between a DHCP client and a DHCP server.

DHCP relay supports the attachment of dynamic profiles and also interacts with the local AAA Service Framework to use back-end authentication servers, such as RADIUS, to provide subscriber authentication. You can attach dynamic profiles and configure authentication support on a global basis or for a specific group of interfaces.

The extended DHCP and DHCPv6 relay agent options configured with the **dhcp-relay** and **dhcpv6** statements are incompatible with the DHCP/BOOTP relay agent options configured with the **bootp** statement. As a result, the extended DHCP or DHCPv6 relay agent and the DHCP/BOOTP relay agent cannot both be enabled on the router at the same time.

The remaining statements are explained separately.

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

**Related Documentation**

- *Configuring DHCP and BOOTP*

## filter (VLANs)

---

|                                 |                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX4600, OCX1100, QFabric System, QFX Series standalone switches                                                                                                                                                                                                                       |
| <b>Syntax</b>                   | filter (input   output) <i>filter-name</i> ;                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit vlans <i>vlan-name</i> ],<br>[edit vlans <i>vlan-name</i> forwarding-options]                                                                                                                                                                                                   |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 11.1 for the QFX Series.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.                                                                                                                                     |
| <b>Description</b>              | Apply a firewall filter to traffic entering or exiting a VLAN.                                                                                                                                                                                                                        |
| <b>Default</b>                  | All incoming traffic is accepted unmodified to a VLAN, and all outgoing traffic is sent unmodified from a VLAN.                                                                                                                                                                       |
| <b>Options</b>                  | <p><b><i>filter-name</i></b>—Name of a firewall filter defined at the [edit firewall family <i>family-name</i> filter] hierarchy level.</p> <p><b>input</b>—Apply a firewall filter to VLAN ingress traffic.</p> <p><b>output</b>—Apply a firewall filter to VLAN egress traffic.</p> |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                    |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <i>Configuring Firewall Filters</i></li> <li>• <i>Overview of Firewall Filters</i></li> </ul>                                                                                                                                                |

## forwarding-options

**Supported Platforms** EX4600, QFX Series standalone switches

**Syntax** forwarding-options {  
     **dhcp-relay** {  
         active-server-group *server-group-name*;  
         authentication {  
             password *password-string*;  
             username-include {  
                 circuit-type;  
                 delimiter *delimiter-character*;  
                 domain-name *domain-name-string*;  
                 interface-name;  
                 logical-system-name;  
                 mac-address;  
                 option-60;  
                 option-82 <circuit-id> <remote-id>;  
                 routing-instance-name;  
                 user-prefix *user-prefix-string*;  
             }  
         }  
     }  
     dhcpv6 {  
         active-server-group *server-group-name*;  
         authentication {  
             password *password-string*;  
             username-include {  
                 circuit-type;  
                 client-id;  
                 delimiter *delimiter-character*;  
                 domain-name *domain-name-string*;  
                 interface-name;  
                 logical-system-name;  
                 relay-agent-interface-id;  
                 relay-agent-remote-id;  
                 relay-agent-subscriber-id;  
                 routing-instance-name;  
                 user-prefix *user-prefix-string*;  
             }  
         }  
     }  
     dynamic-profile *profile-name* {  
         aggregate-clients (merge | replace);  
         use-primary *primary-profile-name*;  
     }  
     group *group-name* {  
         active-server-group *server-group-name*;  
         authentication {  
             ...  
         }  
         dynamic-profile *profile-name* {  
             ...  
         }  
         interface *interface-name* {  
             exclude;  
             liveness-detection {

```

failure-action (clear-binding | clear-binding-if-interface-up | log-only);
method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
}
overrides {
 ...
}
service-profile dynamic-profile-name;
trace;
upto upto-interface-name;
}
service-profile dynamic-profile-name;
}
overrides {
 ...
}
relay-agent-interface-id {
 ...
}
}
service-profile dynamic-profile-name;
liveness-detection {
 failure-action (clear-binding | clear-binding-if-interface-up | log-only);
 method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
 }
}
}

```

```

}
overrides {
 allow-snooped-clients;
 interface-client-limit number;
 no-allow-snooped-clients;
 no-bind-on-request;
 send-release-on-delete;
}
relay-agent-interface-id {
 prefix prefix;
 use-interface-description (logical | device);
}
server-group {
 server-group-name {
 server-ip-address;
 }
}
dynamic-profile profile-name {
 aggregate-clients (merge | replace);
 use-primary primary-profile-name;
}
forward-snooped-clients (all-interfaces | configured-interfaces |
 non-configured-interfaces);
group group-name {
 active-server-group server-group-name;
 authentication {
 ...
 }
}
dynamic-profile profile-name {
 ...
}
interface interface-name {
 exclude;
 liveness-detection {
 failure-action (clear-binding | clear-binding-if-interface-up | log-only);
 method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
 }
}
overrides {
 ...
}

```



```

 }
 service-profile dynamic-profile-name;
 trace;
 upto upto-interface-name;
 }
 overrides {
 ...
 }
 relay-option-60 {
 ...
 }
 relay-option-82 {
 ...
 }
 service-profile dynamic-profile-name;
}
liveness-detection {
 failure-action (clear-binding | clear-binding-if-interface-up | log-only);
 method {
 bfd {
 version (0 | 1 | automatic);
 minimum-interval milliseconds;
 minimum-receive-interval milliseconds;
 multiplier number;
 no-adaptation;
 transmit-interval {
 minimum-interval milliseconds;
 threshold milliseconds;
 }
 detection-time {
 threshold milliseconds;
 }
 session-mode (automatic | multihop | singlehop);
 holddown-interval milliseconds;
 }
 }
}
overrides {
 allow-snooped-clients;
 always-write-giaddr;
 always-write-option-82;
 client-discover-match <option60-and-option82>;
 disable-relay;
 interface-client-limit number;
 layer2-unicast-replies;
 no-allow-snooped-clients;
 no-bind-on-request;
 proxy-mode;
 replace-ip-source-with;
 send-release-on-delete;
 trust-option-82;
}
relay-option-82 {
 circuit-id {
 prefix prefix;
 use-interface-description (logical | device);
 }
}

```

```
 }
 }
 server-group {
 server-group-name {
 server-ip-address;
 }
 }
 service-profile dynamic-profile-name;
}
dhcp-security {
 arp-inspection;
 group group-name {
 interface interface-name {
 static-ip ip-address {
 mac mac-address;
 }
 }
 }
 overrides {
 no-option82;
 trusted;
 untrusted;
 }
}
ip-source-guard;
no-dhcp-snooping;
option-82 {
 circuit-id {
 prefix {
 host-name;
 logical-system-name;
 routing-instance-name;
 }
 use-interface-description (device | logical);
 use-vlan-id;
 }
 remote-id {
 host-name hostname;
 use-interface-description (device | logical);
 use-string string;
 }
 vendor-id {
 use-string string;
 }
}
}
fip-security {
 examine-vn2vf;
 examine-vn2vn {
 beacon-period milliseconds;
 }
 fc-map fc-map-value;
 interface interface-name {
 (fcoe-trusted | no-fcoe-trusted;)
 }
}
}
```

|                                 |                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Hierarchy Level</b>          | <a href="#">[edit]</a><br><a href="#">[edit vlans]</a>                                                                      |
| <b>Release Information</b>      | Statement introduced before Junos OS Release 7.4.<br>Statement introduced in Junos OS Release 11.3 for QFX Series switches. |
| <b>Description</b>              | Configure traffic forwarding.<br><br>The statements are explained separately.                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.     |

## interface (VLANs)

---

|                                 |                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | <a href="#">EX4600</a> , <a href="#">EX4600</a> , <a href="#">EX4600</a> , <a href="#">EX4600</a> , <a href="#">EX4600</a> , <a href="#">EX4600</a> , <a href="#">QFabric System</a> , <a href="#">QFX Series standalone switches</a> |
| <b>Syntax</b>                   | <pre>interface <i>interface-name</i> {     mapping (native (push   swap)   tag (push   swap)); }</pre>                                                                                                                                |
| <b>Hierarchy Level</b>          | <a href="#">[edit vlans <i>vlan-name</i>]</a>                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 11.1 for the QFX Series.                                                                                                                                                                     |
| <b>Description</b>              | For a specific VLAN, configure an interface.                                                                                                                                                                                          |
| <b>Options</b>                  | <i>interface-name</i> —Name of the interface.<br><br>The remaining statement is explained separately.                                                                                                                                 |
| <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>• <i>Example: Setting Up Basic Bridging and a VLAN on the QFX Series</i></li> <li>• <i>Configuring VLANs</i></li> <li>• <i>Understanding Bridging and VLANs</i></li> </ul>                     |

## interface-mac-limit

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms | ACX Series, EX Series, M Series, MX Series, QFX Series standalone switches, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Syntax              | <pre>interface-mac-limit <i>limit</i> {     packet-action drop; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Hierarchy Level     | <pre>[edit bridge-domains <i>bridge-domain-name</i> bridge-options], [edit bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options], [edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> switch-options], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> switch-options interface <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> switch-options], [edit logical-systems <i>logical-system-name</i> switch-options interface <i>interface-name</i>], [edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options], [edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i>], [edit routing-instances <i>routing-instance-name</i> switch-options], [edit routing-instances <i>routing-instance-name</i> switch-options interface <i>interface-name</i>], [edit switch-options], [edit switch-options], [edit switch-options interface <i>interface-name</i>], [edit switch-options interface <i>interface-name</i>], [edit vlans <i>vlan-name</i> switch-options], [edit vlans <i>vlan-name</i> switch-options interface <i>interface-name</i>]</pre> |
| Release Information | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for the <b>switch-options</b> statement added in Junos OS Release 9.2.</p> <p>Support for top-level configuration for the <b>virtual-switch</b> type of routing instance added in Junos OS Release 9.2. In Junos OS Release 9.1 and earlier, the routing instances hierarchy supported this statement only for a VPLS instance or a bridge domain configured within a virtual switch.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p> <p>[edit switch-options], [edit switch-options interface <i>interface-name</i>], [edit vlans <i>vlan-name</i> switch-options], and [edit vlans <i>vlan-name</i> switch-options interface <i>interface-name</i>] hierarchy levels introduced in Junos OS Release 12.3R2 for EX Series switches.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Description         | Configure a limit to the number of MAC addresses that can be learned from a bridge domain, VLAN, virtual switch, or set of bridge domains or VLANs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



**NOTE:** For multichassis link aggregation (MC-LAG) peers in active-active mode, configuring the `interface-mac-limit` statement or changing the `interface-mac-limit` configuration when traffic is flowing can cause the MAC entries to be out of synchronization between the two MC-LAG peers, which might result in flooding. To avoid flooding, you must either halt traffic forwarding and then configure the `interface-mac-limit` statement or use the `commit at` configuration statement to commit the changes at the same time in both the peer nodes.

Alternatively, if flooding does occur, you can clear the bridge MAC table on both the routers or switches by using the `clear bridge mac-table` command. Running this command ensures that the MAC entries are re-learned and in synchronization between both the peers.

**Default** For an access port, the default MAC limit is 1024 MAC addresses. For a trunk port, the default MAC limit is 8192 MAC addresses.

**Options** *limit*—Maximum number of MAC addresses learned from an interface.

**Range:** 1 through 524287 MAC addresses per interface

The remaining statement is 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 Layer 2 Learning and Forwarding for Bridge Domains](#)
- [Layer 2 Learning and Forwarding for VLANs Overview on page 6](#)
- [Understanding Layer 2 Learning and Forwarding for Bridge Domains Functioning as Switches with Layer 2 Trunk Ports](#)
- [Layer 2 Learning and Forwarding for VLANs Acting as a Switch for a Layer 2 Trunk Port](#)

## interface-mode

**Supported Platforms** [EX Series](#), [MX Series](#), [QFX Series standalone switches](#), [SRX Series](#)

**Syntax** `interface-mode (access | trunk <inter-switch-link>);`

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number* family bridge],  
[edit interfaces *interface-name* unit *logical-unit-number* family ethernet-switching],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family bridge]

**Release Information** Statement introduced in Junos OS Release 9.2.  
Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.  
Statement introduced in Junos OS Release 13.2 for the QFX Series.  
Statement introduced in Junos OS Release 15.1.  
**inter-switch-link** option introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.

**Description**



**NOTE:** This statement supports the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see [port-mode](#). For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

(QFX Series 3500 and 3600 standalone switches)—Determine whether the logical interface accepts or discards packets based on VLAN tags. Specify the **trunk** option to accept packets with a VLAN ID that matches the list of VLAN IDs specified in the **vlan-id** or **vlan-id-list** statement, then forward the packet within the bridge domain or VLAN configured with the matching VLAN ID. Specify the **access** option to accept packets with no VLAN ID, then forward the packet within the bridge domain or VLAN configured with the VLAN ID that matches the VLAN ID specified in the **vlan-id** statement.



**NOTE:** On MX Series routers, if you want IGMP snooping to be functional for a bridge domain, then you should not configure **interface-mode** and **irb** for that bridge. Such a configuration commit succeeds, but IGMP snooping is not functional, and a message informing the same is displayed. For more information, see *Configuring a Trunk Interface on a Bridge Network*.

**Options** **access**—Configure a logical interface to accept untagged packets. Specify the VLAN to which this interface belongs using the **vlan-id** statement.

**trunk**—Configure a single logical interface to accept packets tagged with any VLAN ID specified with the **vlan-id** or **vlan-id-list** statement.

**trunk inter-switch-link**—For a private VLAN, configure the InterSwitch Link protocol (ISL) on a trunk port of the primary VLAN in order to connect the switches composing the

PVLAN to each other. You do not need to configure an ISL when a PVLAN is configured on a single switch. This configuration specifies whether the particular interface assumes the role of interswitch link for the PVLAN domains of which it is a member. This option is supported only on MX240, MX480, and MX960 routers in enhanced LAN mode.

|                                 |                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                             |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>Configuring Access Mode on a Logical Interface</i></li><li>• <i>Configuring a Logical Interface for Trunk Mode</i></li><li>• <i>Example: Connecting Access Switches to a Distribution Switch</i></li><li>• <i>Tunnel Services Overview</i></li><li>• <i>Configuring Tunnel Interfaces on MX Series Routers</i></li></ul> |

## irb (Interfaces)

**Supported Platforms** EX Series, MX Series, QFX Series standalone switches

**Syntax** `irb {`  
     `accounting-profile` *name*;  
     `description` *text*;

    (`gratuitous-arp-reply` | `no-gratuitous-arp-reply`);  
     `hold-time` *up milliseconds* *down milliseconds*;  
     `mtu` *bytes*;  
     `no-gratuitous-arp-request`;

`traceoptions` {  
         `flag` *flag*;  
     }  
     (`traps` | `no-traps`);  
     `unit` *logical-unit-number* {  
         `accounting-profile` *name*;  
         `bandwidth` *rate*;  
         `description` *text*;  
         `enhanced-convergence`;  
         `disable`;  
         `encapsulation` *type*;  
         `family` *inet* {  
             `accounting` {  
                 `destination-class-usage`;  
                 `source-class-usage` {  
                     `input`;  
                     `output`;  
                 }  
             }  
         }  
         `address` *ipv4-address* {  
             `arp` *ip-address* (*mac* | *multicast-mac*) *mac-address* <*publish*>;  
             `broadcast` *address*;  
             `preferred`;  
             `primary`;  
             `vrrp-group` *group-number* {  
                 (`accept-data` | `no-accept-data`);  
                 `advertise-interval` *seconds*;  
                 `advertisements-threshold` *number*;  
                 `authentication-key` *key*;  
                 `authentication-type` *authentication*;  
                 `fast-interval` *milliseconds*;  
                 (`preempt` | `no-preempt`) {  
                     `hold-time` *seconds*;  
                 }  
             }  
             `priority` *number*;  
             `track` {  
                 `interface` *interface-name* {  
                     `bandwidth-threshold` *bandwidth*;  
                     `priority-cost` *number*;  
                 }  
             }  
             `priority-hold-time` *seconds*;  
         }  
     }



```

 route ip-address/mask routing-instance instance-name priority-cost cost;
 }
 virtual-address [addresses];
 vrrp-inherit-from {
 active-group group-number;
 active-interface interface-name;
 }
}
filter {
 input filter-name;
 output filter-name;
}
mtu bytes;
no-neighbor-learn;
no-redirects;
primary;
rpf-check {
 fail-filter filter-name;
 mode {
 loose;
 }
}
targeted-broadcast {
 forward-and-send-to-re;
 forward-only;
}
}
family inet6 {
 accounting {
 destination-class-usage;
 source-class-usage {
 input;
 output;
 }
 }
}
address address {
 eui-64;
 ndp ip-address (mac | multicast-mac) mac-address <publish>;
 preferred;
 primary;
 vrrp-inet6-group group-id {
 accept-data | no-accept-data;
 advertisements-threshold number;
 authentication-key key;
 authentication-type authentication;
 fast-interval milliseconds;
 inet6-advertise-interval milliseconds;
 preempt | no-preempt {
 hold-time seconds;
 }
 }
 priority number;
 track {
 interface interface-name {
 bandwidth-threshold bandwidth priority-cost number;
 priority-cost number;

```

```
 }
 priority-hold-time seconds;
 route ip-address/mask routing-instance instance-name priority-cost cost;
 }
 virtual-inet6-address [addresses];
 virtual-link-local-address ipv6-address;
 vrrp-inherit-from {
 active-group group-number;
 active-interface interface-name;
 }
}
}
(dad-disable | no-dad-disable);
filter {
 input filter-name;
 output filter-name;
}
mtu bytes;
nd6-stale-time seconds;
no-neighbor-learn;
no-redirects;
policer {
 input policer-name;
 output policer-name;
}
rpf-check {
 fail-filter filter-name;
 mode {
 loose;
 }
}
}
family iso {
 address interface-address;
 mtu bytes;
}
family mpls {
 filter {
 input filter-name;
 output filter-name;
 }
 mtu bytes;
 policer {
 input policer-name;
 output policer-name;
 }
}
native-inner-vlan-id vlan-id;
proxy-arp (restricted | unrestricted);
(traps | no-traps);
vlan-id-list [vlan-id's];
vlan-id-range [vlan-id-range];
}
}
```

|                                 |                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i>                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br><b>irb</b> option introduced in Junos OS Release 13.2 for the QFX Series. |
| <b>Description</b>              | Configure the properties of a specific integrated bridging and routing (IRB) interface.<br><br>The remaining statements are explained separately.    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                              |

## l3-interface (VLAN)

### Supported Platforms

|                            |                                                                                                                                                                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | l3-interface (vlan. <i>logical-interface-number</i>   irb. <i>logical-interface-number</i> );                                                                                                                                       |
| <b>Hierarchy Level</b>     | [edit vlans <i>vlan-name</i> ]                                                                                                                                                                                                      |
| <b>Release Information</b> | Statement introduced in Junos OS Release 11.1 for the QFX Series.<br><b>irb</b> option introduced in Junos OS Release 13.2 for the QFX Series.                                                                                      |
| <b>Description</b>         | Associate a Layer 3 interface with the VLAN. Configure Layer 3 interfaces on trunk ports to allow the interface to transfer traffic between VLANs. Traffic between VLANs must be routed, which requires a common Layer 3 interface. |
| <b>Default</b>             | No Layer 3 (routing) interface is associated with the VLAN.                                                                                                                                                                         |
| <b>Options</b>             | vlan. <i>logical-interface-number</i> —Number of the logical interface. Use the <b>unit</b> number that you used when you created the <b>vlan</b> interface with a <b>set interfaces vlan unit</b> statement.                       |



**NOTE:** Use this statement with versions of Junos OS that do not support Enhanced Layer 2 Software (ELS).

*irb.logical-interface-number*—Logical interface defined with a **set interfaces irb** statement.



**NOTE:** Use this statement with versions of Junos OS that support Enhanced Layer 2 Software (ELS).

|                                 |                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <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 ethernet-switching interfaces on page 212](#)
  - [show vlans on page 225](#)

## mac (Static MAC-Based VLANs)

---

|                                 |                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFabric System, QFX Series standalone switches, SRX Series                                                                      |
| <b>Syntax</b>                   | <pre>mac <i>mac-address</i> {<br/>    next-hop <i>interface-name</i>;<br/>}</pre>                                                          |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options static vlan <i>vlan-name</i> ]                                                                            |
| <b>Description</b>              | <p>Specify the MAC address to add to the Ethernet switching table.</p> <p>The remaining statement is explained separately.</p>             |
| <b>Options</b>                  | <i>mac-address</i> —MAC address                                                                                                            |
| <b>Required Privilege Level</b> | <p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>               |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)</i></li></ul> |

## members

### Supported Platforms

**Syntax** `members [(all | names | vlan-ids)];`

**Hierarchy Level** [edit interfaces *interface-name* unit 0 family ethernet-switching vlan]

**Release Information** Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** For trunk interfaces, configure the VLANs for which the interface can carry traffic.



**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**—Specify that this trunk interface be a member of all the VLANs that are configured on this switch. When a new VLAN is configured on the switch, this trunk interface automatically becomes a member of the VLAN.



**NOTE:** Each VLAN that is configured must have a specified VLAN ID when you attempt to commit the configuration; otherwise, the configuration commit fails. Also, all cannot be the name of a VLAN on the switch.

***names***—Names of one or more VLANs.

***vlan-ids***—Numeric identifiers of one or more VLANs.

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

**Related Documentation**

- [Example: Setting Up Basic Bridging and a VLAN on the QFX Series](#)
- [Understanding Bridging and VLANs on page 7](#)
- [show ethernet-switching interfaces on page 212](#)
- [show vlans on page 225](#)

## native-vlan-id

---

### Supported Platforms

**Syntax** `native-vlan-id vlan-id;`

**Hierarchy Level** For platforms without ELS:

[edit interfaces *interface-name* unit 0 family ethernet-switching],

For platforms with ELS:

[edit interfaces *interface-name*]

**Release Information** Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Configure the VLAN identifier to associate with untagged packets received on the interface. The logical interface on which untagged packets are received must be configured with the same VLAN ID as the native VLAN ID configured on the physical interface. To configure the logical interface, include the **vlan-id** statement (matching the **native-vlan-id** statement on the physical interface) at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level.

When the **native-vlan-id** statement is combined with the **interface-mode** statement, untagged packets are accepted and forwarded within the bridge domain or VLAN that is configured with the matching VLAN ID.

When the **native-vlan-id** statement is combined with the **flexible-vlan-tagging** statement, untagged packets are accepted on the interfaces that are configured for Q-in-Q tunneling.

**Options** **vlan-id**—Numeric identifier of the VLAN.  
**Range:** 1 through 4094

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

**Related Documentation**

- [Junos OS Network Interfaces Configuration Guide](#)
- [show ethernet-switching interfaces on page 212](#)
- [show vlans on page 225](#)

## packet-action

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms | ACX Series, EX Series, M Series, MX Series, QFX Series standalone switches, SRX Series, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Syntax              | packet-action <i>action</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Hierarchy Level     | <p>[edit bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit bridge-domains <i>bridge-domain-name</i> bridge-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit protocols l2-learning global-mac-limit <i>limit</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols evpn interface-mac-limit (VPLS)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols evpn interface <i>interface-name</i> interface-mac-limit (VPLS)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols evpn mac-table-size <i>limit</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit switch-options <b>mac-table-size</b> <i>limit</i>],</p> <p>[edit switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit vlans <i>vlan-name</i> switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit vlans <i>vlan-name</i> switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit vlans <i>vlan-name</i> switch-options <b>mac-table-size</b> <i>limit</i>],</p> <p>[edit vlans <i>vlan-name</i> switch-options <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit vlans <i>vlan-name</i> switch-options interface <i>interface-name</i> <b>interface-mac-limit</b> <i>limit</i>],</p> <p>[edit vlans <i>vlan-name</i> switch-options <b>mac-table-size</b> <i>limit</i>]</p> |
| Release Information | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for the <b>switch-options</b> statement added in Junos OS Release 9.2.</p> <p>Support for top-level configuration for the <b>virtual-switch</b> type of routing instance added in Junos OS Release 9.2. In Junos OS Release 9.1 and earlier, the routing instances hierarchy</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

supported this statement only for a VPLS instance or a bridge domain configured within a virtual switch.

Support for logical systems added in Junos OS Release 9.6.

[edit switch-options interface *interface-name* interface-mac-limit *limit*], [edit switch-options interface-mac-limit *limit*], [edit switch-options mac-table-size *limit*], [edit vlans *vlan-name* switch-options interface *interface-name* interface-mac-limit *limit*], [edit vlans *vlan-name* switch-options interface-mac-limit *limit*], and [edit vlans *vlan-name* switch-options mac-table-size *limit*] hierarchy levels introduced in Junos OS Release 12.3R2 for EX Series switches.

Support for EVPNs introduced in Junos OS Release 13.2 on MX Series 3D Universal Edge Routers.

Support at the [edit switch-options interface *interface-name* interface-mac-limit *limit*] hierarchy level and hierarchy levels under [edit vlans *vlan-name*] introduced in Junos OS Release 13.2X50-D10 for EX Series switches and Junos OS Release 13.2 for the QFX Series.

**Description** Specify the action taken when packets with new source MAC addresses are received after the MAC address limit is reached. If this statement is not configured, packets with new source MAC addresses are forwarded by default.

**Default**



**NOTE:** On a QFX Series Virtual Chassis, if you include the shutdown option at the [edit vlans *vlan-name* switch-options interface *interface-name* interface-mac-limit packet-action] hierarchy level and issue the commit operation, the system generates a commit error. The system does not generate an error if you include the shutdown option at the [edit switch-options interface *interface-name* interface-mac-limit packet-action] hierarchy level.

Disabled. The default is for packets for new source MAC addresses to be forwarded after the MAC address limit is reached.

**Options**

**drop**—Drop packets with new source MAC addresses, and do not learn the new source MAC addresses.

**drop-and-log**—(EX Series switches and QFX Series only) Drop packets with new source MAC addresses, and generate an alarm, an SNMP trap, or a system log entry.

**log**—(EX Series switches and QFX Series only) Hold packets with new source MAC addresses, and generate an alarm, an SNMP trap, or a system log entry.

**none**—(EX Series switches and QFX Series only) Forward packets with new source MAC addresses, and learn the new source MAC address.

**shutdown**—(EX Series switches and QFX Series only) Disable the specified interface, and generate an alarm, an SNMP trap, or a system log entry.

**Required Privilege Level**

routing—To view this statement in the configuration.

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



**Related  
Documentation**

- *Configuring EVPN Routing Instances*
- *Configuring EVPN Routing Instances on EX9200 Switches*
- [Configuring MAC Limiting \(CLI Procedure\) on page 38](#)
- *Configuring Persistent MAC Learning (CLI Procedure)*
- *Understanding Layer 2 Learning and Forwarding for Bridge Domains*
- [Layer 2 Learning and Forwarding for VLANs Overview on page 6](#)
- *Understanding Layer 2 Learning and Forwarding for Bridge Domains Functioning as Switches with Layer 2 Trunk Ports*
- [Layer 2 Learning and Forwarding for VLANs Overview on page 6](#)
- *Layer 2 Learning and Forwarding for VLANs Acting as a Switch for a Layer 2 Trunk Port*

## port-mode

---

### Supported Platforms

**Syntax** `port-mode (access | tagged-access | trunk);`

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number* family ethernet-switching]

**Release Information** Statement introduced in Junos OS Release 11.1 for the QFX Series.

### Description



**NOTE:** This statement does not support the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that supports ELS, see [interface-mode](#). For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

Configure whether an interface on the switch operates in access, tagged access, or trunk mode.

**Default** All switch interfaces are in access mode.

**Options** **access**—Have the interface operate in access mode. In this mode, the interface can be in a single VLAN only. Access interfaces typically connect to network devices, such as PCs, printers, IP telephones, and IP cameras.

**tagged-access**—Have the interface operate in tagged-access mode. In this mode, the interface can be in multiple VLANs. Tagged access interfaces typically connect to network devices, such as PCs, printers, IP telephones, and IP cameras.

**trunk**—Have the interface operate in trunk mode. In this mode, the interface can be in multiple VLANs and can multiplex traffic between different VLANs. Trunk interfaces typically connect to other switches and to routers on the LAN.

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

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

**Related Documentation**

- *Example: Configuring Reflective Relay for Use with VEPA Technology*

---

## service-id

---

|                                 |                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series standalone switches                                                                                                               |
| <b>Syntax</b>                   | service-id <i>number</i> ;                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit switch-options]<br>[edit vlans <i>vlan-name</i> ]                                                                                                            |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 12.3R2 for EX Series switches and MX Series routers.<br>Statement introduced in Junos OS Release 13.2 for the QFX Series. |
| <b>Description</b>              | Specify a service identifier for each multichassis aggregated Ethernet interface that belongs to a link aggregation group (LAG).                                   |
| <b>Options</b>                  | <b>number</b> —A number that identifies a particular service.<br><b>Range:</b> 1 through 65535                                                                     |
| <b>Required Privilege Level</b> | system—To view this statement in the configuration.<br>system control—To add this statement to the configuration.                                                  |

## switch-options

**Supported Platforms** EX Series, MX Series, QFX Series standalone switches

**Syntax**

```
switch-options {
 interface interface-name {
 interface-mac-limit limit {
 packet-action drop;
 }
 no-mac-learning;
 static-mac static-mac-address {
 vlan-id number;
 }
 }
 interface-mac-limit limit {
 packet-action drop;
 }
 mac-statistics;
 mac-table-size limit {
 packet-action drop;
 }
 no-mac-learning;
 service-id number;
 vtep-source-interface
}
```

**Hierarchy Level** [edit *number*],  
[edit vlans *vlan--name*],  
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* vlans  
*vlan-name*],  
[edit routing-instances *routing-instance-name* vlans *vlan-name*]

**Release Information** Statement introduced in Junos OS Release 12.3R2 for EX Series switches and MX Series routers.  
Statement introduced in Junos OS Release 13.2 for the QFX Series.

**Description** Configure Layer 2 learning and forwarding properties for a VLAN or a virtual switch.  
  
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.

## static (Static MAC-Based VLANs)

|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFabric System, QFX Series standalone switches, SRX Series                                                                                 |
| <b>Syntax</b>                   | <pre>static {   vlan <i>vlan-name</i> {     mac <i>mac-address</i> {       next-hop <i>interface-name</i>;     }   } }</pre>                          |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options]                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 11.1 for EX Series switches.                                                                                 |
| <b>Description</b>              | <p>Specify VLAN and MAC addresses to add to the Ethernet switching table.</p> <p>The remaining statements are explained separately.</p>               |
| <b>Required Privilege Level</b> | <p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>                          |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)</a></li> </ul> |

## static-mac

|                                 |                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFX Series standalone switches                                                                                                                        |
| <b>Syntax</b>                   | static-mac <i>mac-address</i> ;                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit vlans <i>vlan-name</i> switch-options interface <i>interface-name</i> ]                                                                                    |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 13.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 13.2 for the QFX Series.</p>            |
| <b>Description</b>              | Specify a static MAC address to assign to this interface.                                                                                                        |
| <b>Options</b>                  | <i>mac-address</i> —MAC address                                                                                                                                  |
| <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="#">Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure)</a> on page 27</li> </ul> |

## vlan-id (VLANs)

---

**Supported Platforms** [QFX Series](#)

**Syntax** `vlan-id number`;

**Hierarchy Level** For platforms without ELS:

`[edit vlans vlan-name vlan-range]`

For platforms without ELS and with ELS:

`[edit vlans vlan-name]`

For ELS platforms only:

`[edit interfaces interface-name unit number]`

`[edit vlans vlan-name vlan-id-list]`

**Release Information** Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Configure an 802.1Q tag to apply to all traffic that originates on the VLAN.

**Default** On a QFX3500 and QFX3500 switch, if you use the default factory configuration, all traffic originating on the VLAN is untagged and has a VLAN identifier of 1. The number zero is reserved for priority tagging and the number 4093 is also reserved.

On a QFX5100 switch, if you use the default factory configuration, all traffic originating on the VLAN is untagged and has a VLAN identifier of 1. The number zero is reserved for priority tagging and the number 4093 is also reserved.



**NOTE:** You can only create up 4090 VLANs on a QFX5100 switch. If you create more than 4090 VLANs, the interfaces associated with the extra VLANs are not displayed in the `show vlans` command output. For example, if you create 4094 VLANs, the extra VLANs will not have interfaces associated with the VLANs. The order in which you configure the extra VLANs determines which interfaces are missing from the `show vlans` command output.

---

**Options** *number* —VLAN tag identifier.

**Range:** 0 through 4093.

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

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

**Related Documentation**

- *Example: Setting Up Bridging with Multiple VLANs*
- *Understanding Bridging and VLANs*

## vlan-id-list

**Supported Platforms** EX Series, MX Series, QFX Series standalone switches, SRX Series

**Syntax** `vlan-id-list [ vlan-id-numbers ];`

**Hierarchy Level** [edit bridge-domains *bridge-domain-name*],  
[edit logical-systems *logical-system-name* bridge-domains *bridge-domain-name*],  
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name*  
bridge-domains *bridge-domain-name*],  
[edit routing-instances *routing-instance-name* bridge-domains *bridge-domain-name*]  
[edit interfaces *interface-name* unit 0],  
[edit interfaces *interface-name* unit *logical-unit-number*],  
[edit vlans *vlan-name*]

**Release Information** Statement introduced in Junos OS Release 9.4.  
Support for logical systems added in Junos OS Release 9.6.  
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.  
Statement introduced in Junos OS Release 13.2 for the QFX Series.

**Description** Specify a VLAN identifier list to use for a bridge domain or VLAN in trunk mode.

Specify the **trunk** option in the **interface-mode** statement to accept packets with a VLAN ID that matches the list of VLAN IDs specified in the **vlan-id-list** statement to forward the packet within the bridge domain or VLAN configured with the matching VLAN ID. Specify the **access** option to accept packets with no VLAN ID to forward the packet within the bridge domain or VLAN configured with the VLAN ID that matches the VLAN ID specified in the **vlan-id** statement.

This statement also enables you to bind a logical interface to a list of VLAN IDs, thereby configuring the logical interface to receive and forward a frame with a tag that matches the specified VLAN ID list.



**WARNING:** On some EX and QFX Series switches, you can apply no more than eight VLAN identifier lists to a physical interface.

**Options** *vlan-id-numbers*—Valid VLAN identifiers. You can combine individual numbers with range lists including a hyphen.

**Range:** 0 through 4095



**NOTE:** On EX Series switches and the QFX Series, the range is 0 through 4094.

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

- Related Documentation**
- *Configuring a Bridge Domain*
  - *Configuring a VLAN*
  - *Configuring VLAN Identifiers for Bridge Domains and VPLS Routing Instances*
  - *Configuring VLAN Identifiers for VLANs and VPLS Routing Instances*

---

## vlan-rewrite

---

|                                 |                                                                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series standalone switches, SRX Series                                                                                                                                                                                  |
| <b>Syntax</b>                   | vlan-rewrite translate (200 500   201 501)                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>number</i> family bridge interface-mode trunk]<br>[edit interfaces <i>interface-name</i> unit <i>number</i> family ethernet-switching interface-mode trunk]                                        |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.4.<br>Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2 for the QFX Series.                                                     |
| <b>Description</b>              | Translates an incoming VLAN to a bridge-domain VLAN, corresponding counter translation at egress. Supports translation of VLAN 200 to VLAN 500 and VLAN 201 to VLAN 501. Other valid VLANs pass through without translation.                      |
| <b>Options</b>                  | <b>translate 200 500</b> —Translates incoming packets with VLAN 200 to 500.<br><br><b>translate 201 501</b> —Translates incoming packets with VLAN 201 to 501.<br><br><b>translate 202 502</b> —Translates incoming packets with VLAN 202 to 502. |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                           |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>Rewriting a VLAN Tag and Adding a New Tag</i></li></ul>                                                                                                                                                |



## vlan-tagging

---

|                                 |                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX4600, QFX Series standalone switches                                                                                    |
| <b>Syntax</b>                   | vlan-tagging;                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]<br>[edit interfaces interface-range <i>interface-range-name</i> ]                |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 11.3 for the QFX Series.                                                         |
| <b>Description</b>              | Enable VLAN tagging. The platform receives and forwards single-tag frames with 802.1Q VLAN tags.                          |
| <b>Default</b>                  | VLAN tagging is disabled by default.                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.   |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>vlan-id</i></li><li>• <i>Configuring a Layer 3 Logical Interface</i></li></ul> |

## vlan-tags

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series standalone switches                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Syntax</b>                   | vlan-tags outer <i>number</i> inner <i>number</i> ;                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit bridge-domains <i>bridge-domain-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i><br>bridge-domains <i>bridge-domain-name</i> ],<br>[edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> ]<br>[edit vlans <i>vlan-name</i> ]   |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Support for logical systems added in Junos OS Release 9.6.<br>Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2X51-D10 for QFX Series switches.                                                                                                                                                                    |
| <b>Description</b>              | Specify dual VLAN identifier tags for a bridge domain, VLAN, or VPLS routing instance.                                                                                                                                                                                                                                                                                                                                                     |
| <b>Options</b>                  | <b>outer <i>number</i></b> —A valid VLAN identifier.<br><br><b>inner <i>number</i></b> —A valid VLAN identifier.                                                                                                                                                                                                                                                                                                                           |
| <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>• <i>Configuring a Bridge Domain</i></li><li>• <i>Configuring a VLAN</i></li><li>• <i>Configuring VLAN Identifiers for Bridge Domains and VPLS Routing Instances</i></li><li>• <i>Configuring VLAN Identifiers for VLANs and VPLS Routing Instances</i></li><li>• <i>Configuring a Layer 2 Virtual Switch for MX Series Routers.</i></li><li>• <i>Configuring a Layer 2 Virtual Switch</i></li></ul> |

## vlan

**Supported Platforms** EX4600, QFX Series standalone switches

**Syntax**

```
vlan {
 vlan-name {
 description text-description;
 domain-type bridge;
 forwarding-options {
 dhcp-security {
 arp-inspection;
 group group-name {
 interface interface-name {
 static-ip ip-address {
 mac mac-address;
 }
 }
 }
 }
 overrides {
 no-option82;
 trusted;
 untrusted;
 }
 }
 ip-source-guard;
 no-dhcp-snooping;
 option-82 {
 circuit-id {
 prefix {
 host-name;
 logical-system-name;
 routing-instance-name;
 }
 use-interface-description (device | logical);
 use-vlan-id;
 }
 remote-id {
 host-name hostname;
 use-interface-description (device | logical);
 use-string string;
 }
 vendor-id {
 use-string string;
 }
 }
 }
}
fip-security {
 examine-vn2vf;
 examine-vn2vn {
 beacon-period milliseconds;
 }
 fc-map fc-map-value;
 interface interface-name {
 (fcoe-trusted | no-fcoe-trusted;)
 }
}
```

```
}
l3-interface irb.logical-unit-number;
multicast-snooping-options {
 flood-groups [group-names];
 forwarding-cache {
 threshold {
 reuse threshold;
 suppress threshold;
 }
 }
}
graceful-restart {
 disable;
 restart-duration duration;
}
host-outbound-traffic {
 dot1p bits;
 forwarding-class forwarding-class;
}
multichassis-lag-replicate-state;
nexthop-hold-time time;
options {
 syslog {
 level level;
 mark interval;
 upto level;
 }
}
traceoptions {
 file filename {
 files number;
 no-world-readable;
 size file-size;
 world-readable;
 }
 flag flag {
 disable;
 }
}
}
switch-options {
 interface interface-name {
 interface-mac-limit limit {
 packet-action action;
 }
 static-mac mac-address;
 }
 interface-mac-limit limit {
 packet-action action;
 }
 mac-move-limit limit {
 packet-action action;
 }
 mac-table-size limit {
 packet-action drop;
 }
 no-mac-learning;
}
```

```

 }
 }
 vlan-id number;
 vlan-id-list [vlan-id | vlan-id-vlan-id];
 vlan-tags
 inner value;
 outer value;
 }
 vxlan {
 ingress-node-replication
 ovsdb-managed
 }
}
}

```

**Hierarchy Level** [edit]

**Release Information** Statement introduced in Junos OS Release 13.2 for the QFX Series.  
Statements for private VLANs and Q-in-Q tunneling introduced in Junos OS Release 12.1 for the QFX Series.

**Description** Configure VLAN properties on the QFX Series.

**Default** If you use the default factory configuration, all switch interfaces become part of the VLAN default.

**Options** *vlan-name*—Name of the VLAN. The name can contain letters, numbers, hyphens (-), and periods (.) and can be up to 255 characters long.

The remaining statements are described separately.

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

**Related Documentation**

- [Understanding Bridging and VLANs on page 7](#)
- [Configuring VLANs on page 14](#)



## CHAPTER 7

# MAC Address Configuration Statements

- [global-mac-table-aging-time](#) on page 149
- [mac-limit](#) on page 150
- [mac-notification](#) on page 151
- [mac-statistics](#) on page 152
- [mac-table-size](#) on page 154
- [notification-interval](#) on page 156

### [global-mac-table-aging-time](#)

---

|                                 |                                                                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | <a href="#">EX Series</a> , <a href="#">MX Series</a> , <a href="#">QFX Series standalone switches</a> , <a href="#">SRX Series</a>                                                                                                                 |
| <b>Syntax</b>                   | <code>global-mac-table-aging-time seconds;</code>                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit protocols l2-learning]                                                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.2.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                         |
| <b>Description</b>              | Configure the timeout interval for entries in the MAC table.                                                                                                                                                                                        |
| <b>Default</b>                  | 300 seconds                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <b>seconds</b> —Time elapsed before MAC table entries are timed out and entries are deleted from the table.<br><b>Range:</b> For MX Series routers: 10 through 1 million; for EX Series and QFX Series switches: 60 through 1 million               |
| <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="#">Configuring the MAC Table Timeout Interval</a></li><li>• <a href="#">Configuring MAC Table Aging (CLI Procedure)</a></li><li>• <a href="#">Configuring MAC Table Aging</a> on page 40</li></ul> |

## mac-limit

---

|                            |                                                                                  |
|----------------------------|----------------------------------------------------------------------------------|
| <b>Supported Platforms</b> | EX4600, QFabric System, QFX Series standalone switches                           |
| <b>Syntax</b>              | mac-limit <i>number</i> ;                                                        |
| <b>Hierarchy Level</b>     | [edit vlans <i>vlan-name</i> ]                                                   |
| <b>Release Information</b> | Statement introduced in Junos OS Release 11.1 for the QFX Series.                |
| <b>Description</b>         | Configure the number of MAC addresses allowed on a VLAN.                         |
| <b>Default</b>             | MAC limit is disabled.                                                           |
| <b>Options</b>             | <i>number</i> —Maximum number of MAC addresses.<br><b>Range:</b> 1 through 32768 |



**NOTE:** This statement is not supported on QFabric systems.

---

|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 vlans on page 225</a></li><li>• <i>Example: Setting Up Basic Bridging and a VLAN on the QFX Series</i></li><li>• <i>Configuring MAC Table Aging</i></li><li>• <i>Understanding Bridging and VLANs</i></li></ul> |



---

## mac-notification

---

|                                 |                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX4600, QFX Series                                                                                                                                                                                                                                                  |
| <b>Syntax</b>                   | <pre>mac-notification {<br/>    notification-interval <i>seconds</i>;<br/>}</pre>                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options]<br>[edit switch-options]                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 11.1 for the QFX Series.<br>Hierarchy level <b>[edit switch-options]</b> added in Junos OS Release 14.1X53-D10 for EX Series and QFX Series.                                                                               |
| <b>Description</b>              | <p>Enable MAC notification for a switch. If you configure this statement without setting a notification interval, MAC notification is enabled with the default MAC notification interval of 30 seconds.</p> <p>The remaining statement is explained separately.</p> |
| <b>Default</b>                  | MAC notification is disabled 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>• <i>Configuring MAC Notification</i></li><li>• <a href="#">Configuring MAC Notification (CLI Procedure) on page 36</a></li></ul>                                                                                             |

## mac-statistics

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | ACX Series, EX Series, M Series, MX Series, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Syntax</b>                   | mac-statistics;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | <p>[edit bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> switch-options],</p> <p>[edit logical-systems <i>logical-system-name</i> switch-options],</p> <p>[edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit routing-instances <i>routing-instance-name</i> switch-options],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols evpn],</p> <p>[edit switch-options],</p> <p>[edit switch-options],</p> <p>[edit vlans <i>vlan-name</i> switch-options]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for the <b>switch-options</b> statement added in Junos OS Release 9.2.</p> <p>Support for top-level configuration for the <b>virtual-switch</b> type of routing instance added in Junos OS Release 9.2. In Junos OS Release 9.1 and earlier, the routing instances hierarchy supported this statement only for a VPLS instance or a bridge domain configured within a virtual switch.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p> <p>[edit switch-options] and [edit vlans <i>vlan-name</i> switch-options] hierarchy levels introduced in Junos OS Release 12.3R2 for EX Series switches.</p> <p>Support for EVPNs added in Junos OS Release 13.2 for MX 3D Series routers.</p> <p>[edit switch-options] and [edit vlans <i>vlan-name</i> switch-options] hierarchy levels introduced in Junos OS Release 13.2 for the QFX Series.</p>                          |
| <b>Description</b>              | (MX Series routers, EX Series switches, and QFX Series only) For bridge domains or VLANs, enable MAC accounting either for a specific bridge domain or VLAN, or for a set of bridge domains or VLANs associated with a Layer 2 trunk port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>                  | disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <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="#">Understanding Layer 2 Learning and Forwarding for Bridge Domains</a></li> <li>• <a href="#">Layer 2 Learning and Forwarding for VLANs Overview on page 6</a></li> <li>• <a href="#">Understanding Layer 2 Learning and Forwarding for Bridge Domains Functioning as Switches with Layer 2 Trunk Ports</a></li> <li>• <a href="#">Layer 2 Learning and Forwarding for VLANs Acting as a Switch for a Layer 2 Trunk Port</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

- *Configuring EVPN Routing Instances*
- *Configuring EVPN Routing Instances on EX9200 Switches*

## mac-table-size

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b> | ACX Series, EX Series, M Series, MX Series, QFabric System, QFX Series standalone switches, SRX Series, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Syntax</b>              | <pre>mac-table-size limit {     packet-action drop; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>     | <p>[edit bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit logical-systems <i>logical-system-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> switch-options],</p> <p>[edit logical-systems <i>logical-system-name</i> switch-options],</p> <p>[edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> bridge-options],</p> <p>[edit routing-instances <i>routing-instance-name</i> switch-options],</p> <p>[edit switch-options],</p> <p>[edit switch-options],</p> <p>[edit vlans <i>vlan-name</i> switch-options]</p> |
| <b>Release Information</b> | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Support for the <b>switch-options</b> statement added in Junos OS Release 9.2.</p> <p>Support for top-level configuration for the <b>virtual-switch</b> type of routing instance added in Junos OS Release 9.2. In Junos OS Release 9.1 and earlier, the routing instances hierarchy supported this statement only for a VPLS instance or a bridge domain configured within a virtual switch.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p> <p><b>[edit switch-options]</b> and <b>[edit vlans <i>vlan-name</i> switch-options]</b> hierarchy levels introduced in Junos OS Release 12.3R2 for EX Series switches.</p> <p>Support at the <b>[edit vlans <i>vlan-name</i> switch-options]</b> hierarchy level introduced in Junos OS Release 13.2 for the QFX Series.</p>                      |
| <b>Description</b>         | Modify the size of the MAC address table for the bridge domain or VLAN, a set of bridge domains or VLANs associated with a trunk port, or a virtual switch. The default is 5120 MAC addresses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



**NOTE:** For multichassis link aggregation (MC-LAG) peers in active-active mode, configuring the **mac-table-size** statement or changing the **mac-table-size** configuration when traffic is flowing can cause the MAC entries to be out of synchronization between the two MC-LAG peers, which might result in flooding. To avoid flooding, you must either halt traffic forwarding and then configure the **mac-table-size** statement or use the **commit at configuration** statement to commit the changes at the same time in both the peer nodes.

Alternatively, if flooding does occur, you can clear the bridge MAC table on both the routers by using the **clear bridge mac-table** command. Running this command ensures that the MAC entries are re-learned and in synchronization between both the peers.

.....

**Options**    *limit*—Specify the maximum number of addresses in the MAC address table.  
**Range:** 16 through 1,048,575 MAC addresses  
**Default:** 5120 MAC addresses There is no default MAC address limit for the **mac-table-size** statement at the **[edit switch-options]** hierarchy level. The number of MAC addresses that can be learned is only limited by the platform, 65,535 MAC addresses for EX Series switches and 1,048,575 MAC addresses for other devices.

The remaining statement is 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 Layer 2 Learning and Forwarding for Bridge Domains*
- [Layer 2 Learning and Forwarding for VLANs Overview on page 6](#)
- *Understanding Layer 2 Learning and Forwarding for Bridge Domains Functioning as Switches with Layer 2 Trunk Ports*
- *Layer 2 Learning and Forwarding for VLANs Acting as a Switch for a Layer 2 Trunk Port*

## notification-interval

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | <a href="#">QFX Series</a>                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Syntax</b>                   | notification-interval <i>seconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit ethernet-switching-options mac-notification]<br>[edit switch-options mac-notification]                                                                                                                                                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 11.1 for the QFX Series.<br>Hierarchy level <b>[edit switch-options]</b> added in Junos OS Release 14.1X53-D10 for EX Series and QFX Series.                                                                                                                                                                                                                                                 |
| <b>Description</b>              | <p>Configure the MAC notification interval for a switch.</p> <p>The MAC notification interval is the amount of time the switch waits before sending learned or unlearned MAC address SNMP notifications to the network management server. For instance, if the MAC notification interval is set to 10, all of the MAC address addition and removal SNMP notifications are sent to the network management system every 10 seconds.</p> |
| <b>Options</b>                  | <p><b>seconds</b>—The MAC notification interval, in seconds.</p> <p><b>Range:</b> 1 through 60</p> <p><b>Default:</b> 30</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="#">Configuring MAC Notification</a></li><li>• <a href="#">Configuring MAC Notification (CLI Procedure) on page 36</a></li></ul>                                                                                                                                                                                                                                                      |

## CHAPTER 8

# STP Configuration Statements

- [bpdu-block on page 158](#)
- [bpdu-block-on-edge on page 159](#)
- [bpdu-timeout-action on page 160](#)
- [bridge-priority \(Spanning Trees\) on page 161](#)
- [configuration-name on page 162](#)
- [cost on page 163](#)
- [disable \(Spanning Trees\) on page 164](#)
- [bpdu-block on page 165](#)
- [bpdu-block-on-edge on page 166](#)
- [bpdu-timeout-action on page 167](#)
- [bridge-priority \(Spanning Trees\) on page 168](#)
- [configuration-name on page 169](#)
- [cost on page 170](#)
- [disable \(Spanning Trees\) on page 171](#)
- [disable-timeout \(Spanning Trees\) on page 172](#)
- [edge on page 173](#)
- [force-version \(IEEE 802.1D STP\) on page 174](#)
- [forward-delay on page 175](#)
- [hello-time on page 176](#)
- [interface \(BPDU\) on page 177](#)
- [interface \(Spanning Tree\) on page 178](#)
- [max-age on page 179](#)
- [max-hops on page 180](#)
- [mode \(Protocols STP\) on page 181](#)
- [msti on page 182](#)
- [no-root-port on page 183](#)
- [priority \(Protocols STP\) on page 184](#)
- [protocol on page 185](#)

- [protocols \(STP Type\) on page 186](#)
- [revision-level on page 187](#)
- [rstp on page 188](#)
- [traceoptions \(Spanning Tree\) on page 189](#)
- [vlan \(MSTP\) on page 192](#)
- [vlan \(VSTP\) on page 193](#)
- [vlan \(VSTP\) on page 194](#)
- [vlan-group on page 195](#)
- [vstp on page 196](#)

---

## bpdu-block

---

**Supported Platforms** [EX Series, MX Series, QFX Series](#)

**Syntax** `bpdu-block {  
    interface (interface-name disable | all);  
    disable-timeout seconds;  
}`

**Hierarchy Level** `[edit protocols layer2-control ]`

**Release Information** Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.

**Description** Enable BPDU blocking on an interface.

The remaining statements are explained separately.

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

**Related Documentation**

- [Understanding BPDU Protection for Spanning-Tree Instance Interfaces](#)
- [BPDU Protection for Individual Spanning-Tree Instance Interfaces](#)
- [Configuring BPDU Protection for Spanning-Tree Instance Interfaces](#)
- [show spanning-tree bridge](#)
- [show spanning-tree interface](#)
- [Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches](#)



## bpdu-block-on-edge

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Syntax</b>                   | bpdu-block-on-edge;                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp)],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols<br>(mstp   rstp   vstp)],<br>[edit protocols ( mstp   rstp  vstp )],<br>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp)]                                                                                                                   |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.4.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | Enable BPDU blocking on the edge ports of a virtual switch.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <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>• <i>Understanding BPDU Protection for Spanning-Tree Instance Interfaces</i></li> <li>• <i>BPDU Protection on All Edge Ports of the Bridge</i></li> <li>• <i>Configuring BPDU Protection on All Edge Ports</i></li> <li>• <a href="#">Configuring BPDU Protection on Spanning Tree Interfaces on page 72</a></li> <li>• <a href="#">rstp on page 188</a></li> <li>• <i>mstp</i></li> <li>• <a href="#">vstp on page 196</a></li> </ul> |

## bpdu-timeout-action

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                |
| <b>Syntax</b>                   | bpdu-timeout-action (log   block);                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp)],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols<br>(mstp   rstp   vstp)],<br>[edit protocols (mstp   rstp   vstp) interface ],<br>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp)]                                       |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.4.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | Provide STP loop protection for a given STP family protocol interface.                                                                                                                                                                                                                                                                                                                                      |
| <b>Default</b>                  | If the <b>bpdu-timeout-action</b> statement is not configured, an interface that stops receiving BPDUs will transition to the designated port (forwarding) state, creating a potential loop.                                                                                                                                                                                                                |
| <b>Options</b>                  | <b>log</b> —The interface logs the fact that it has not received BPDUs during the timeout interval.<br><br><b>block</b> —The interface is blocked and the fact that the interface has not received BPDUs during the timeout interval is logged.                                                                                                                                                             |
| <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>• <i>Understanding Loop Protection for Spanning-Tree Instance Interfaces</i></li><li>• <i>Configuring Loop Protection for a Spanning-Tree Instance Interface</i></li><li>• <i>Example: Enabling Loop Protection for Spanning-Tree Protocols</i></li><li>• <a href="#">rstp on page 188</a></li><li>• <i>mstp</i></li><li>• <a href="#">vstp on page 196</a></li></ul> |

## bridge-priority (Spanning Trees)

|                                 |                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFX Series                                                                                                                                                                                                                                                                                                                                                         |
| <b>Syntax</b>                   | bridge-priority <i>priority</i> ;                                                                                                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit protocols mstp],<br>[edit protocols mstp <i>msti msti-id</i> ],<br>[edit protocols <i>rstp</i> ],<br>[edit protocols <i>vstp</i> vlan <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>              | 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>                  | <i>priority</i> —Bridge priority. It can be set only in increments of 4096.<br><b>Range:</b> 0 through 61,440<br><b>Default:</b> 32,768                                                                                                                                                                                                                                       |
| <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>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul> |

## configuration-name

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Syntax</b>                   | configuration-name <i>configuration-name</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols mstp],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp],<br>[edit protocols mstp],<br>[edit routing-instances <i>routing-instance-name</i> protocols mstp]                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | Specify the configuration name , which 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>• <i>Understanding BPDUs used for Exchanging Information among Bridges</i></li><li>• <i>Configuring Multiple Spanning-Tree Protocol</i></li><li>• <i>Configuring MSTP</i></li><li>• <i>show spanning-tree bridge</i></li><li>• <i>show spanning-tree interface</i></li><li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li><li>• <a href="#">Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</a></li><li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li></ul> |

## cost

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Syntax</b>                   | cost cost;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Configure link cost to control which bridge is the designated bridge and which port is the designated port. By default, the link cost is determined by the link speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <p><b>cost</b>—(Optional) Link cost associated with the port.</p> <p><b>Range:</b> 1 through 200,000,000</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>• <i>Spanning-Tree Instance Interface</i></li> <li>• <i>Spanning-Tree Instance Interface Cost</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Understanding RSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## disable (Spanning Trees)

**Supported Platforms** [EX Series](#), [QFX Series](#)

**Syntax** `disable;`

**Hierarchy Level** `[edit protocols mstp interface interface-name,  
[edit protocols mstp msti msti-id vlan (all vlan-id | vlan-name) interface interface-name],  
[edit protocols rstp interface interface-name],  
[edit protocols vstp vlan vlan-id interface interface-name]`

**Release Information** Statement introduced in Junos OS Release 9.0 for EX Series switches.  
Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.  
Statement updated in Junos OS Release 15.1 for EX Series switches.

**Description** Disable MSTP, RSTP, or VSTP on a specific interface.



**NOTE:** You cannot disable spanning tree parameters for all interfaces.

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

- Related Documentation**
- [Configuring RSTP \(CLI Procedure\) on page 63](#)
  - [Configuring MSTP](#)
  - [Configuring MSTP](#)
  - [Configuring VLAN Spanning Tree Protocol](#)
  - `show spanning-tree bridge`
  - `show spanning-tree interface`

## bpdu-block

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Syntax</b>                   | <pre>bpdu-block {   interface (<i>interface-name</i> disable   all);   disable-timeout <i>seconds</i>; }</pre>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols layer2-control ]                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | <p>Enable BPDU blocking on an interface.</p> <p>The remaining statements are explained separately.</p>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                             |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <i>Understanding BPDU Protection for Spanning-Tree Instance Interfaces</i></li> <li>• <i>BPDU Protection for Individual Spanning-Tree Instance Interfaces</i></li> <li>• <i>Configuring BPDU Protection for Spanning-Tree Instance Interfaces</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches</i></li> </ul> |

## bpdu-block-on-edge

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Syntax</b>                   | bpdu-block-on-edge;                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp)],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols<br>(mstp   rstp   vstp)],<br>[edit protocols ( mstp   rstp  vstp )],<br>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp)]                                                                                                           |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.4.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | Enable BPDU blocking on the edge ports of a virtual switch.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <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>• <i>Understanding BPDU Protection for Spanning-Tree Instance Interfaces</i></li><li>• <i>BPDU Protection on All Edge Ports of the Bridge</i></li><li>• <i>Configuring BPDU Protection on All Edge Ports</i></li><li>• <a href="#">Configuring BPDU Protection on Spanning Tree Interfaces on page 72</a></li><li>• <a href="#">rstp on page 188</a></li><li>• <i>mstp</i></li><li>• <a href="#">vstp on page 196</a></li></ul> |



## bpdu-timeout-action

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Syntax</b>                   | bpdu-timeout-action (log   block);                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp)],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols<br>(mstp   rstp   vstp)],<br>[edit protocols (mstp   rstp   vstp) interface ],<br>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp)]                                              |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.4.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | Provide STP loop protection for a given STP family protocol interface.                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>                  | If the <b>bpdu-timeout-action</b> statement is not configured, an interface that stops receiving BPDUs will transition to the designated port (forwarding) state, creating a potential loop.                                                                                                                                                                                                                       |
| <b>Options</b>                  | <b>log</b> —The interface logs the fact that it has not received BPDUs during the timeout interval.<br><br><b>block</b> —The interface is blocked and the fact that the interface has not received BPDUs during the timeout interval is logged.                                                                                                                                                                    |
| <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>• <i>Understanding Loop Protection for Spanning-Tree Instance Interfaces</i></li> <li>• <i>Configuring Loop Protection for a Spanning-Tree Instance Interface</i></li> <li>• <i>Example: Enabling Loop Protection for Spanning-Tree Protocols</i></li> <li>• <a href="#">rstp on page 188</a></li> <li>• <i>mstp</i></li> <li>• <a href="#">vstp on page 196</a></li> </ul> |

## bridge-priority (Spanning Trees)

---

|                          |                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms      | EX Series, QFX Series                                                                                                                                                                                                                                                                                                                                                   |
| Syntax                   | bridge-priority <i>priority</i> ;                                                                                                                                                                                                                                                                                                                                       |
| Hierarchy Level          | [edit protocols mstp],<br>[edit protocols mstp <i>msti msti-id</i> ],<br>[edit protocols <i>rstp</i> ],<br>[edit protocols <i>vstp</i> vlan <i>vlan-id</i> ]                                                                                                                                                                                                            |
| Release Information      | 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.                                                                                                                                                                                                           |
| Description              | 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.                                                                                                       |
| Default                  | 32,768                                                                                                                                                                                                                                                                                                                                                                  |
| Options                  | <i>priority</i> —Bridge priority. It can be set only in increments of 4096.<br><b>Range:</b> 0 through 61,440<br><b>Default:</b> 32,768                                                                                                                                                                                                                                 |
| Required Privilege Level | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                     |
| Related Documentation    | <ul style="list-style-type: none"><li>• <i>show spanning-tree bridge</i></li><li>• <i>show spanning-tree interface</i></li><li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li><li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li><li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li></ul> |

## configuration-name

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Syntax</b>                   | configuration-name <i>configuration-name</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols mstp],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp],<br>[edit protocols mstp],<br>[edit routing-instances <i>routing-instance-name</i> protocols mstp]                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | Specify the configuration name , which 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>• <i>Understanding BPDUs used for Exchanging Information among Bridges</i></li> <li>• <i>Configuring Multiple Spanning-Tree Protocol</i></li> <li>• <i>Configuring MSTP</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <a href="#">Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</a></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> </ul> |

## cost

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Syntax</b>                   | cost cost;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Configure link cost to control which bridge is the designated bridge and which port is the designated port. By default, the link cost is determined by the link speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <p><b>cost</b>—(Optional) Link cost associated with the port.</p> <p><b>Range:</b> 1 through 200,000,000</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>• <i>Spanning-Tree Instance Interface</i></li> <li>• <i>Spanning-Tree Instance Interface Cost</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Understanding RSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## disable (Spanning Trees)

### Supported Platforms

**Syntax**    disable;

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

**Release Information**    Statement introduced in Junos OS Release 9.0 for EX Series switches.  
Statement updated in Junos OS Release 9.4 for EX Series switches to add VSTP support.  
Statement updated in Junos OS Release 15.1 for EX Series switches.

**Description**    Disable MSTP, RSTP, or VSTP on a specific interface.



**NOTE:** You cannot disable spanning tree parameters for all interfaces.

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

- Related Documentation**
- [Configuring RSTP \(CLI Procedure\) on page 63](#)
  - [Configuring MSTP](#)
  - [Configuring MSTP](#)
  - [Configuring VLAN Spanning Tree Protocol](#)
  - [show spanning-tree bridge](#)
  - [show spanning-tree interface](#)

## disable-timeout (Spanning Trees)

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Syntax</b>                   | disable-timeout <i>seconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols layer2-control <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 is disabled by BPDU blocking. If this option is not configured, the interface is not periodically checked and remains disabled.                                                                                                                                                                                                                                                                                        |
| <b>Default</b>                  | The disable timeout is not enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <i>seconds</i> —Amount of time, in seconds, the interface receiving BPDUs protect is disabled. The range is 10 through 3600 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>• <i>show spanning-tree bridge</i></li><li>• <i>show spanning-tree interface</i></li><li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li><li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li><li>• <a href="#">Example: Configuring BPDU Protection on Edge Interfaces to Prevent STP Miscalculations on page 67</a></li><li>• <i>Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches</i></li></ul> |

## edge

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Syntax</b>                   | edge;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Configure interfaces as edge ports. Edge ports do not expect to receive BPDUs. If a BPDU is received, the port becomes a nonedge port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <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>• <i>Spanning-Tree Instance Interface</i></li> <li>• <i>Configuring a Spanning-Tree Instance Interface as an Edge Port for Faster Convergence</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <i>Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## force-version (IEEE 802.1D STP)

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series                                                                                                                                                                                                                                                                                                                                                              |
| <b>Syntax</b>                   | force-version stp;                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols (rstp   vstp)],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (rstp   vstp)],<br>[edit protocols (rstp   vstp)],<br>[edit routing-instances <i>routing-instance-name</i> protocols (rstp   vstp)]                                                                   |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                   |
| <b>Description</b>              | Force the spanning-tree protocol version to be the original IEEE 802.1D STP.                                                                                                                                                                                                                                                                                                                  |
| <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>• <i>Spanning-Tree Protocols Supported</i></li><li>• <i>RSTP or VSTP Forced to Run as IEEE 802.1D STP</i></li><li>• <i>Reverting to RSTP or VSTP from Forced IEEE 802.1D STP</i></li><li>• <i>Understanding RSTP for EX Series and QFX Series Switches</i></li><li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li></ul> |



## forward-delay

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Syntax</b>                   | forward-delay <i>seconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit protocols (mstp   rstp)],</p> <p>[edit protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan vlan-id</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | For 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>Options</b>                  | <p><b><i>seconds</i></b>—(Optional) Number of seconds the bridge port remains in the listening and learning states.</p> <p><b>Range:</b> 4 through 30</p> <p><b>Default:</b> 15 seconds</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>• <i>Forward Delay Before Ports Transition to Forwarding State</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <a href="#">Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</a></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul>                                                                                                                                                           |

## hello-time

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Syntax</b>                   | hello-time <i>seconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit protocols (mstp   rstp)],</p> <p>[edit protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan vlan-id</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | Specify the number of seconds between transmissions of configuration BPDUs by the root bridge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Options</b>                  | <p><b><i>seconds</i></b>—(Optional) Number of seconds between transmissions of configuration BPDUs.</p> <p><b>Range:</b> 1 through 10</p> <p><b>Default:</b> 2 seconds</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><i>Hello Time for Root Bridge to Transmit Hello BPDUs</i></li> <li><i>show spanning-tree bridge</i></li> <li><i>show spanning-tree interface</i></li> <li><i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li><a href="#">Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</a></li> <li><i>Understanding MSTP for EX Series and QFX Series Switches</i></li> <li><i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul>                                                                                                                                                                                |

## interface (BPDU)

---

**Supported Platforms** [EX4600, QFX Series](#)

**Syntax** `interface (all | [interface-name]) {  
 drop;  
}`

- Hierarchy Level**
- For platforms with ELS CLI:  
    [edit protocols layer2-control]
  - For platforms with Original CLI:  
    [edit ethernet-switching-options]

**Release Information** Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Apply BPDU protection to all interfaces or one or more interfaces.

**Options** `all`—All interfaces.  
  
`interface-name`—Name of the interface.  
  
`drop`—Drops xSTP BPDUs.

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

- Related Documentation**
- *Example: Configuring Network Regions for VLANs with MSTP*
  - *Example: Configuring Faster Convergence and Improving Network Stability with RSTP*
  - *Understanding BPDU Protection for STP, RSTP, and MSTP*
  - [show spanning-tree bridge on page 250](#)
  - [show spanning-tree interface on page 255](#)

## interface (Spanning Tree)

**Supported Platforms** [EX Series](#), [QFX Series](#)

**Syntax** `interface (interface-name disable | all){  
     bpdu-timeout-action {  
         alarm;  
         block;  
     }  
     cost cost;  
     edge;  
     mode (p2p | shared);  
     no-root-port;  
     priority interface-priority;  
}`

**Hierarchy Level** [edit protocols (mstp | [rstp](#) | [vstp](#))],  
 [edit protocols vstp vlan *vlan-id*],  
 [edit protocols vstp [vlan-group](#) group *group-name* vlan (vlan-id | vlan-range  
 |open-set-of-values)

**Release Information** Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.  
 Statement updated in Junos OS Release 15.1 for EX Series switches to support  
 configuration of spanning tree parameters globally on all interfaces.



**NOTE:** You cannot disable spanning tree parameters globally on all interfaces.

**Description** Configure the interface to participate in the RSTP, MSTP, or VSTP instance.

**Options** *interface-name*—Name of a Gigabit Ethernet or 10-Gigabit Ethernet interface.

The remaining statements are explained separately.

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

**Related Documentation**

- [Configuring RSTP \(CLI Procedure\) on page 63](#)
- [Configuring MSTP](#)
- [Configuring MSTP](#)
- [Configuring VLAN Spanning Tree Protocol](#)
- [show spanning-tree interface](#)
- [Understanding RSTP for EX Series and QFX Series Switches](#)
- [Understanding MSTP for EX Series and QFX Series Switches](#)
- [Understanding VSTP for EX Series Switches and QFX Series Switches](#)

## max-age

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Syntax</b>                   | max-age <i>seconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit protocols (mstp   rstp)],</p> <p>[edit protocols vstp <i>vlan vlan-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <i>vlan vlan-id</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | Specify the maximum expected arrival time of hello BPDUs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Options</b>                  | <p><b><i>seconds</i></b>—(Optional) Number of seconds expected between hello BPDUs.</p> <p><b>Range:</b> 6 through 40</p> <p><b>Default:</b> 20 seconds</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>• <i>Maximum Age for Awaiting Arrival of Hello BPDUs</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <i>Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</i></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul>                                                                                                                                                                              |

## max-hops

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                        |
| <b>Syntax</b>                   | max-hops <i>hops</i> ;                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols mstp],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp],<br>[edit protocols mstp],<br>[edit routing-instances <i>routing-instance-name</i> protocols mstp]                                                                                             |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                         |
| <b>Description</b>              | Configure the maximum number of hops a BPDU can be forwarded in the MSTP region.                                                                                                                                                                                                                                                                                                    |
| <b>Options</b>                  | <b>hops</b> —(Optional) Number of hops the BPDU can be forwarded.<br><b>Range:</b> 1 through 255<br><b>Default:</b> 19 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>• <i>Configuring Multiple Spanning-Tree Protocol</i></li><li>• <i>Configuring MSTP</i></li><li>• <i>show spanning-tree bridge</i></li><li>• <i>show spanning-tree interface</i></li><li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li><li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li></ul> |

## mode (Protocols STP)

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Syntax              | mode (p2p   shared);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Hierarchy Level     | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>]</p> |
| Release Information | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Description         | Configure link mode to identify point-to-point links.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



**NOTE:** When the link is configured as full-duplex, the default link mode is p2p. When the link is configured half-duplex, the default link mode is shared.

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Options                  | <p><b>p2p</b>—The link is point to point.</p> <p><b>shared</b>—The link is shared media.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Required Privilege Level | <p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Related Documentation    | <ul style="list-style-type: none"> <li>• <i>Spanning-Tree Instance Interface</i></li> <li>• <i>Spanning-Tree Instance Interface Point-to-Point Link Mode</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <i>Example: Configuring Faster Convergence and Improved Network Stability with RSTP on page 46</i></li> <li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li> </ul> |

## msti

**Supported Platforms** EX Series, QFX Series

**Syntax** `msti msti-id {  
     bridge-priority priority;  
     vlan (vlan-id | vlan-range | open-set-of-values);  
     interface (interface-name | all) {  
         cost cost;  
         edge;  
         priority interface-priority;  
     }  
 }`

**Hierarchy Level** [edit protocols mstp],  
 [edit routing-instances *routing-instance-name* protocols mstp]

**Release Information** Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.  
 Statement updated in Junos OS Release 15.1 for EX Series switches to support configuration of spanning tree parameters globally on all interfaces.



**NOTE:** You cannot disable spanning tree parameters globally on all interfaces.

**Description** Configure the multiple spanning-tree instance (MSTI) identifier.

**Options** *msti-id*—MSTI instance identifier.

**Range:** 1 through 4094

The remaining statements are explained separately.

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

**Related Documentation**

- *Configuring MST Instances on a Physical Interface*
- *Configuring MSTP*
- *Example: Configuring Network Regions for VLANs with MSTP*
- *Understanding MSTP for EX Series and QFX Series Switches*



## no-root-port

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Syntax</b>                   | no-root-port;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 9.1.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | Ensure the port is the spanning-tree designated port. If the port receives superior bridge protocol data unit (BPDU) packets, root protect moves this port to a root-prevented spanning-tree state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <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>• <i>Understanding Root Protection for Spanning-Tree Instance Interfaces in a Layer 2 Switched Network</i></li> <li>• <i>Root Protect for a Spanning-Tree Instance Interface</i></li> <li>• <i>Enabling Root Protection for a Spanning-Tree Instance Interface</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## priority (Protocols STP)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Syntax</b>                   | <code>priority interface-priority;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | <p>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit protocols vstp <i>vlan-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp) interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> interface <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols vstp <b>vlan</b> <i>vlan-id</i> interface <i>interface-name</i>]</p> |
| <b>Release Information</b>      | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | Use the interface priority to control which interface is elected as the root port. The interface priority must be set in increments of 16.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <p><b>priority</b>—(Optional) Interface priority.</p> <p><b>Range:</b> 0 through 240</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>• <i>Spanning-Tree Instance Interface</i></li> <li>• <i>Configuring a Spanning-Tree Instance Interface as an Edge Port for Faster Convergence</i></li> <li>• <i>Spanning-Tree Instance Interface Priority</i></li> <li>• <i>[edit protocols mstp] Configuration Statement Hierarchy on EX Series Switches</i></li> <li>• <i>[edit protocols rstp] Configuration Statement Hierarchy on EX Series and QFX Series Switches</i></li> <li>• <i>[edit protocols vstp] Configuration Statement Hierarchy on EX Series and QFX Series Switches</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## protocol

---

|                                 |                                                                                                                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, QFX Series standalone switches                                                                                                                                                                                                                                  |
| <b>Syntax</b>                   | protocol (cdp   stp   vtp   pvstp);                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit protocols layer2-control mac-rewrite interface <i>interface-name</i> ]                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.1.<br>Statement introduced in Junos OS Release 13.2 for QFX series.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for PVSTP introduced in Junos OS Release 13.3.                                          |
| <b>Description</b>              | Configure the protocol to be tunneled on an interface for Layer 2 protocol tunneling. To tunnel multiple protocols, include multiple <b>protocol</b> statements.                                                                                                                                  |
| <b>Options</b>                  | <p><b>cdp</b>—Tunnel the Cisco discovery protocol.</p> <p><b>stp</b>—Tunnel all versions of the spanning-tree protocol.</p> <p><b>vtp</b>—Tunnel the VLAN trunk protocol.</p> <p><b>pvstp</b>—Tunnel the Per-VLAN Spanning Tree Plus (PVST+) protocol</p>                                         |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <i>Layer 2 Protocol Tunneling Through a Network Overview</i></li> <li>• <i>Layer 2 Protocol Tunneling Configuration Guidelines</i></li> <li>• <i>Layer 2 Protocol to be Tunneled</i></li> <li>• <i>Configuring Layer 2 Protocol Tunneling</i></li> </ul> |

## protocols (STP Type)

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Syntax</b>                   | <pre>protocols {<br/>  mstp { ... }<br/>  rstp { ... }<br/>  vstp { ... }<br/>}</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit],<br>[edit logical-systems <i>logical-system-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> ],<br>[edit routing-instances <i>routing-instance-name</i> ]                                                                                                                                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | Configure the Spanning Tree Protocol type as MSTP, RSTP, or VSTP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Options</b>                  | <b>mstp</b> —Configure the protocol as Multiple Spanning Tree.<br><br><b>rstp</b> —Configure the protocol as Rapid Spanning Tree.<br><br><b>vstp</b> —Configure the protocol as VLAN Spanning Tree.                                                                                                                                                                                                                                                                                                                                   |
| <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="#">Configuring RSTP (CLI Procedure) on page 63</a></li><li>• <i>Configuring MSTP</i></li><li>• <i>Configuring MST Instances on a Physical Interface</i></li><li>• <i>Configuring VLAN Spanning Tree Protocol</i></li><li>• <i>Configuring Rapid Spanning-Tree Protocol</i></li><li>• <i>Configuring Multiple Spanning-Tree Protocol</i></li><li>• <i>Configuring VLAN Spanning-Tree Protocol</i></li><li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li></ul> |

## revision-level

---

|                                 |                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                            |
| <b>Syntax</b>                   | revision-level <i>revision-level</i> ;                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols mstp],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp],<br>[edit protocols mstp],<br>[edit routing-instances <i>routing-instance-name</i> protocols mstp]                                                                 |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                             |
| <b>Description</b>              | Set the revision number of the MSTP configuration.                                                                                                                                                                                                                                                                                                      |
| <b>Options</b>                  | <i>revision-level</i> —Configure the revision number of the MSTP region configuration.<br><b>Range:</b> 0 through 65,535                                                                                                                                                                                                                                |
| <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>• <i>Configuring Multiple Spanning-Tree Protocol</i></li> <li>• <i>show spanning-tree bridge</i></li> <li>• <i>show spanning-tree interface</i></li> <li>• <i>Example: Configuring Network Regions for VLANs with MSTP</i></li> <li>• <i>Understanding MSTP for EX Series and QFX Series Switches</i></li> </ul> |

## rstp

**Supported Platforms** EX Series, QFX Series

**Syntax**

```
rstp {
 bpdublock-on-edge;
 bpdubdestination-mac-address provider-bridge-group;
 bridge-priority priority;
 disable;
 extended-system-id;
 force-version stp;
 forward-delay seconds;
 hello-time seconds;
 interface (interface-name disable | interface-range-name | all){
 bpdubtimeout-action {
 alarm;
 block;
 }
 cost cost;
 edge;
 mode (p2p | shared);
 no-root-port;
 priority interface-priority;
 }
 max-age seconds;
 priority-hold-time seconds;
 traceoptions {
 file filename <files number> <size size> <world-readable | no-world-readable>;
 flag flag <flag-modifier> <disable>;
 }
}
```

**Hierarchy Level** [edit protocols]

**Release Information** Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches. Statement updated in Junos OS Release 15.1 for EX Series and QFX Series switches to support configuration of spanning tree parameters globally on all interfaces.



**NOTE:** You cannot disable spanning tree parameters globally on all interfaces.

**Description** Configure RSTP parameters.

**Options** The remaining statements are explained separately.

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

**Related Documentation**

- [Configuring RSTP \(CLI Procedure\) on page 63](#)

## traceoptions (Spanning Tree)

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b> | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Syntax</b>              | <pre>traceoptions {     file <i>filename</i> &lt;files <i>number</i>&gt; &lt;size <i>size</i>&gt; &lt;world-readable   no-world-readable&gt;;     flag <i>flag</i> &lt;flag-modifier&gt; &lt;disable&gt;; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>     | <pre>[edit logical-systems <i>logical-system-name</i> protocols (mstp   rstp   vstp)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp)], [edit protocols (mstp   rstp   vstp   vstp vlan <i>vlan-id</i>)], [edit routing-instances <i>routing-instance-name</i> protocols (mstp   rstp   vstp)]</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Release Information</b> | <p>Statement introduced in Junos OS Release 8.4.</p> <p>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.</p> <p>Support for logical systems added in Junos OS Release 9.6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>         | Set protocol-level tracing options for spanning-tree protocols..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>             | The default STP protocol-level trace options are inherited from the global <b>traceoptions</b> statement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <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>filename</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>trace-file</b> reaches its maximum size, it is renamed <b>trace-file.0</b>, then <b>trace-file.1</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 <b>size</b> option.</p> <p><b>Range:</b> 2 through 1000 files</p> <p><b>Default:</b> 1 trace file only</p> <p><b>flag</b>—Tracing operation to perform. To specify more than one tracing operation, include multiple <b>flag</b> statements. The following are the STP-specific tracing options:</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>bpdu</b>—Trace BPDU reception and transmission.</li> </ul> |

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

The following are the global tracing options:

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

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

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

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



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

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

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

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

**Default:** 1 MB

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

|                                 |                                                             |
|---------------------------------|-------------------------------------------------------------|
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.        |
|                                 | routing-control—To add this statement to the configuration. |
| <b>Related Documentation</b>    | • <i>Spanning-Tree Protocol Trace Options</i>               |
|                                 | • <i>Tracing Spanning-Tree Operations</i>                   |
|                                 | • <i>Example: Tracing Spanning-Tree Protocol Operations</i> |

## vlan (MSTP)

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series, QFX Series, SRX Series                                                                                                                                                                                                                                                                                                                                |
| <b>Syntax</b>                   | vlan <i>vlan-id</i> ;                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols mstp msti <i>msti-id</i> ],<br>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> ],<br>[edit protocols mstp msti <i>msti-id</i> ],<br>[edit routing-instances <i>routing-instance-name</i> protocols mstp msti <i>msti-id</i> ] |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.4.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                                 |
| <b>Description</b>              | Configure the VLAN of an MSTI or VSTP instance or configure the VLAN range of an MSTI.                                                                                                                                                                                                                                                                                      |
| <b>Options</b>                  | <b>vlan-id</b> —The VLAN identifier associated with the MSTI.<br><br><b>vlan-id-range</b> —Range of VLAN identifiers associated with the MSTI in the form <i>minimum-vlan-id-maximum-vlan-id</i> . VLAN identifier ranges are not supported for VSTP.<br><br><b>Range:</b> 1 through 4096                                                                                   |
| <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>• <i>Configuring Multiple Spanning-Tree Protocol</i></li><li>• <i>Configuring MSTP</i></li><li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li></ul>                                                                                                                                                   |

## vlan (VSTP)

|                                 |                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, MX Series                                                                                                                                                                                                                                                                                                     |
| <b>Syntax</b>                   | <pre> vlan <i>vlan-id</i> {   bridge-priority <i>priority</i>;   forward-delay <i>seconds</i>;   hello-time <i>seconds</i>;   max-age <i>seconds</i>;   interface <i>interface-name</i> {     cost <i>cost</i>;     edge;     mode (p2p   shared);     no-root-port;     priority <i>interface-priority</i>;   } }</pre> |
| <b>Hierarchy Level</b>          | [edit logical-systems <i>logical-system-name</i> protocols vstp],<br>[edit protocols vstp]                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.0.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                              |
| <b>Description</b>              | Configure VSTP VLAN parameters.                                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | The statements are explained separately.                                                                                                                                                                                                                                                                                 |
| <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>Configuring VLAN Spanning-Tree Protocol</li> <li>Understanding VSTP for EX Series Switches and QFX Series Switches</li> </ul>                                                                                                                                                     |

## vlan (VSTP)

---

|                          |                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms      | EX Series, MX Series                                                                                                                                                                                                                                                                                                                                                    |
| Syntax                   | <pre>vlan <i>vlan-id</i> {<br/>  bridge-priority <i>priority</i>;<br/>  forward-delay <i>seconds</i>;<br/>  hello-time <i>seconds</i>;<br/>  max-age <i>seconds</i>;<br/>  interface <i>interface-name</i> {<br/>    cost <i>cost</i>;<br/>    edge;<br/>    mode (p2p   shared);<br/>    no-root-port;<br/>    priority <i>interface-priority</i>;<br/>  }<br/>}</pre> |
| Hierarchy Level          | [edit logical-systems <i>logical-system-name</i> protocols vstp],<br>[edit protocols vstp]                                                                                                                                                                                                                                                                              |
| Release Information      | Statement introduced in Junos OS Release 9.0.<br>Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.<br>Support for logical systems added in Junos OS Release 9.6.                                                                                                                                                                             |
| Description              | Configure VSTP VLAN parameters.                                                                                                                                                                                                                                                                                                                                         |
| Options                  | The statements are explained separately.                                                                                                                                                                                                                                                                                                                                |
| Required Privilege Level | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration.                                                                                                                                                                                                                                                     |
| Related Documentation    | <ul style="list-style-type: none"><li>• <a href="#">Configuring VSTP (CLI Procedure) on page 65</a></li><li>• <i>Configuring VLAN Spanning-Tree Protocol</i></li><li>• <i>Understanding VSTP for EX Series Switches and QFX Series Switches</i></li></ul>                                                                                                               |

## vlan-group

**Supported Platforms** [EX Series](#), [QFX Series](#)

**Syntax** `vlan-group group group-name {  
vlan (vlan-id | vlan-group | all) {  
 }  
}`

**Hierarchy Level** [edit protocols [vstp](#)]

**Release Information** Statement introduced in Junos OS Release 15.1 for EX Series switches.

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



**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 the maximum number of allowed VSTP VLANs.

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**

- [vstp on page 196](#)
- *show spanning-tree bridge*
- *show spanning-tree interface*
- *Configuring VLAN Spanning Tree Protocol*
- *Understanding VSTP for EX Series Switches and QFX Series Switches*

## vstp

**Supported Platforms** EX Series, QFX Series

**Syntax**

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

**Hierarchy Level** [edit protocols]

**Release Information** Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.

Statement updated in Junos OS Release 15.1 for EX Series switches to support configuration of spanning tree parameters globally on all interfaces.



**NOTE:** You cannot disable spanning tree parameters globally on all interfaces.

|                                 |                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>              | Configure VSTP parameters.                                                                                          |
| <b>Options</b>                  | The statements are explained separately.                                                                            |
| <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="#">Configuring VSTP (CLI Procedure) on page 65</a></li></ul>       |





## CHAPTER 9

# Q-in-Q Configuration Statements


- [flexible-vlan-tagging on page 200](#)
- [input-vlan-map on page 201](#)
- [native-vlan-id on page 202](#)
- [output-vlan-map \(Gigabit Ethernet IQ and 10-Gigabit Ethernet with SFPP\) on page 203](#)
- [pop on page 204](#)
- [push on page 205](#)
- [swap on page 206](#)
- [vlan-id-list on page 207](#)

## flexible-vlan-tagging


---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | ACX Series, EX Series, M Series, MX Series, PTX Series, QFX Series standalone switches, SRX Series, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Syntax</b>                   | flexible-vlan-tagging;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces aex],<br>[edit interfaces ge-fpc/pic/port],<br>[edit interfaces et-fpc/pic/port],<br>[edit interfaces ps0],<br>[edit interfaces xe-fpc/pic/port]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 8.1.<br>Support for aggregated Ethernet added in Junos OS Release 9.0.<br>Statement introduced in Junos OS Release 12.1x48 for PTX Series Packet Transport Routers.<br>Statement introduced in Junos OS Release 13.2X50-D15 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | <p>Support simultaneous transmission of 802.1Q VLAN single-tag and dual-tag frames on logical interfaces on the same Ethernet port, and on pseudowire logical interfaces.</p> <p>This statement is supported on M Series and T Series routers, for Fast Ethernet and Gigabit Ethernet interfaces only on Gigabit Ethernet IQ2 and IQ2-E, IQ, and IQE PICs, and for aggregated Ethernet interfaces with member links in IQ2, IQ2-E, and IQ PICs or in MX Series DPCs, or on Ethernet interfaces for PTX Series Packet Transport Routers or 100-Gigabit Ethernet Type 5 PIC with CFP. This statement is supported on Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces on EX Series switches.</p> |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>Configuring Mixed Tagging</i></li><li>• <i>Configuring Flexible VLAN Tagging on PTX Series Packet Transport Routers</i></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## input-vlan-map

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | EX Series, MX Series, QFX Series standalone switches                                                                                                                                                                                                                                                                                                                         |
| Syntax                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <pre>input-vlan-map {   (pop   pop-pop   pop-swap   push   push-push   swap   swap-push   swap-swap);   inner-tag-protocol-id <i>tpid</i>;   inner-vlan-id <i>number</i>;   tag-protocol-id <i>tpid</i>;   vlan-id <i>number</i>; }</pre>                                                                                                                                    |
| Hierarchy Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]</p>                                                                                                                                                                    |
| Release Information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>Statement introduced before Junos OS Release 7.4.</p> <p><b>pop-pop</b>, <b>pop-swap</b>, <b>push-push</b>, <b>swap-push</b>, and <b>swap-swap</b> statements introduced in Junos OS Release 8.1.</p> <p>Statement introduced in Junos OS Release 13.2X50-D15 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.</p> |
| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>For Gigabit Ethernet IQ, 10-Gigabit Ethernet SFPP interfaces, 100-Gigabit Ethernet Type 5 PIC with CFP only as well as Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces, define the rewrite profile to be applied to incoming frames on this logical interface.</p> <p>The statements are explained separately.</p>         |
| <div style="display: flex; align-items: center;">  <div> <p><b>NOTE:</b> Connectivity fault management (CFM) sessions for all interfaces in which <b>input-vlan-map</b> is configured are supported only if the interface also has an explicit configuration for <b>output-vlan-map</b> as <b>output-vlan-map pop</b>. See <a href="#">output-vlan-map</a>. This configuration is required for all the interfaces in the topology even when the CFM session is on that interface or on a different interface in the data path of the same topology.</p> </div> </div> |                                                                                                                                                                                                                                                                                                                                                                              |
| Required Privilege Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                           |
| Related Documentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• <i>Stacking a VLAN Tag</i></li> <li>• <a href="#">output-vlan-map on page 203</a></li> <li>• <i>Configuring Q-in-Q Tunneling (CLI Procedure)</i></li> </ul>                                                                                                                                                                         |

## native-vlan-id

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b> | ACX Series, EX Series, M Series, MX Series, QFX Series standalone switches, SRX Series, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Syntax</b>              | native-vlan-id <i>number</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>     | [edit interfaces <i>ge-fpc/pic/port</i> ],<br>[edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Release Information</b> | Statement introduced in Junos OS Release 8.3.<br>Statement introduced in Junos OS Release 12.2 for ACX Series Universal Access Routers.<br>Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>         | <p>Configure mixed tagging support for untagged packets on a port for the following:</p> <ul style="list-style-type: none"> <li>• M Series routers with Gigabit Ethernet IQ PICs with SFP and Gigabit Ethernet IQ2 PICs with SFP configured for 802.1Q flexible VLAN tagging</li> <li>• MX Series routers with Gigabit Ethernet DPCs and MICs, Tri-Rate Ethernet DPCs and MICs, and 10-Gigabit Ethernet DPCs and MICs and MPCs configured for 802.1Q flexible VLAN tagging</li> <li>• T4000 routers with 100-Gigabit Ethernet Type 5 PIC with CFP</li> <li>• EX Series switches with Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces</li> </ul> <p>When the <b>native-vlan-id</b> statement is included with the <b>flexible-vlan-tagging</b> statement, untagged packets are accepted on the same mixed VLAN-tagged port.</p> |
|                            | <p> <b>NOTE:</b> The logical interface on which untagged packets are received must be configured with the same VLAN ID as the native VLAN ID configured on the physical interface, otherwise the untagged packets are dropped.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                            | <p>To configure the logical interface, include the <b>vlan-id</b> statement (matching the <b>native-vlan-id</b> statement on the physical interface) at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>] hierarchy level.</p> <p>When the <b>native-vlan-id</b> statement is included with the <b>interface-mode</b> statement, untagged packets are accepted and forwarded within the bridge domain or VLAN that is configured with the matching VLAN ID.</p>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>             | By default, the untagged packets are dropped. That is, if you do not configure the <b>native-vlan-id</b> option, the untagged packets are dropped.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Options</b>             | <p><i>number</i>—VLAN ID number.</p> <p><b>Range:</b> (ACX Series routers and EX Series switches) 0 through 4094.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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

**Related Documentation**

- *Configuring Mixed Tagging Support for Untagged Packets*
- *Configuring Access Mode on a Logical Interface*
- [Configuring the Native VLAN Identifier \(CLI Procedure\) on page 16](#)
- *Understanding Bridging and VLANs on EX Series Switches*
- [flexible-vlan-tagging on page 200](#)
- *Understanding Q-in-Q Tunneling on EX Series Switches*

## output-vlan-map (Gigabit Ethernet IQ and 10-Gigabit Ethernet with SFPP)

**Supported Platforms** [MX Series](#)

**Syntax** `output-vlan-map {  
 (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);  
 inner-tag-protocol-id tpid;  
 inner-vlan-id number;  
 tag-protocol-id tpid;  
 vlan-id number;  
}`

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before Junos OS Release 7.4.  
**pop-pop**, **pop-swap**, **push-push**, **swap-push**, and **swap-swap** statements added in Junos OS Release 8.1.

**Description** For Gigabit Ethernet IQ and 10-Port 10-Gigabit Ethernet SFPP interfaces only, define the rewrite operation to be applied to outgoing frames on this logical interface.


The statements are explained separately.

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


**Related Documentation**

- *Stacking and Rewriting Gigabit Ethernet VLAN Tags*
- [input-vlan-map on page 201](#)

## pop

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | ACX Series, EX Series, MX Series, QFX Series standalone switches, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Syntax</b>                   | pop;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b> ]                                                                                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before Junos OS Release 7.4.<br>Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | <p> <b>NOTE:</b> On EX4300 switches, <b>pop</b> is not supported at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b>] hierarchy level.</p> <p>For Gigabit Ethernet IQ, 10-Gigabit Ethernet IQ2, and IQ2-E interfaces; 10-Gigabit Ethernet LAN/WAN PIC; aggregated Ethernet interfaces using Gigabit Ethernet IQ interfaces; 100-Gigabit Ethernet Type 5 PIC with CFP; and Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces, specify the VLAN rewrite operation to remove a VLAN tag from the top of the VLAN tag stack. The outer VLAN tag of the frame is removed.</p> |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>Removing a VLAN Tag</li> <li>Configuring Q-in-Q Tunneling (CLI Procedure)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## push

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms      | ACX Series, EX Series, MX Series, QFX Series standalone switches, T4000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Syntax                   | push;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Hierarchy Level          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Release Information      | Statement introduced before Junos OS Release 7.4.<br>Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Description              | <p> <b>NOTE:</b> On EX4300 switches, <b>push</b> is not supported at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b>] hierarchy level.</p> <p>Specify the VLAN rewrite operation to add a new VLAN tag to the top of the VLAN stack. An outer VLAN tag is pushed in front of the existing VLAN tag.</p> <p>You can use this statement on Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces; 10-Gigabit Ethernet LAN/WAN PIC; aggregated Ethernet interfaces using Gigabit Ethernet IQ interfaces; 100-Gigabit Ethernet Type 5 PIC with CFP; and Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces.</p> <p>If you include the <b>push</b> statement in the configuration, you must also include the <b>pop</b> statement at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b>] hierarchy level.</p> |
| Required Privilege Level | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Related Documentation    | <ul style="list-style-type: none"> <li>Stacking a VLAN Tag</li> <li>Configuring Q-in-Q Tunneling (CLI Procedure)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## swap

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | ACX Series, EX Series, MX Series, QFX Series standalone switches, T4000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Syntax</b>                   | swap;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>input-vlan-map</b> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <b>output-vlan-map</b> ]                                                                                                  |
| <b>Release Information</b>      | Statement introduced before Junos OS Release 7.4.<br>Statement introduced in Junos OS Release 12.3R2 for EX Series switches.<br>Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | <p>Specify the VLAN rewrite operation to replace a VLAN tag. The outer VLAN tag of the frame is overwritten with the user-specified VLAN tag information.</p> <p>On MX Series routers, you can enter this statement on Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces, 10-Gigabit Ethernet LAN/WAN PIC, aggregated Ethernet using Gigabit Ethernet IQ interfaces, and 100-Gigabit Ethernet Type 5 PIC with CFP. On EX Series switches, you can enter this statement on Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces.</p> |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>Rewriting the VLAN Tag on Tagged Frames</i></li><li>• <i>Configuring Q-in-Q Tunneling (CLI Procedure)</i></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                   |



## vlan-id-list

**Supported Platforms** EX Series, MX Series, QFX Series standalone switches, SRX Series

**Syntax** `vlan-id-list [ vlan-id-numbers ];`

**Hierarchy Level** [edit bridge-domains *bridge-domain-name*],  
[edit logical-systems *logical-system-name* bridge-domains *bridge-domain-name*],  
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name*  
bridge-domains *bridge-domain-name*],  
[edit routing-instances *routing-instance-name* bridge-domains *bridge-domain-name*]  
[edit interfaces *interface-name* unit 0],  
[edit interfaces *interface-name* unit *logical-unit-number*],  
[edit vlans *vlan-name*]

**Release Information** Statement introduced in Junos OS Release 9.4.  
Support for logical systems added in Junos OS Release 9.6.  
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.  
Statement introduced in Junos OS Release 13.2 for the QFX Series.

**Description** Specify a VLAN identifier list to use for a bridge domain or VLAN in trunk mode.

Specify the **trunk** option in the **interface-mode** statement to accept packets with a VLAN ID that matches the list of VLAN IDs specified in the **vlan-id-list** statement to forward the packet within the bridge domain or VLAN configured with the matching VLAN ID. Specify the **access** option to accept packets with no VLAN ID to forward the packet within the bridge domain or VLAN configured with the VLAN ID that matches the VLAN ID specified in the **vlan-id** statement.

This statement also enables you to bind a logical interface to a list of VLAN IDs, thereby configuring the logical interface to receive and forward a frame with a tag that matches the specified VLAN ID list.



**WARNING:** On some EX and QFX Series switches, you can apply no more than eight VLAN identifier lists to a physical interface.

**Options** *vlan-id-numbers*—Valid VLAN identifiers. You can combine individual numbers with range lists including a hyphen.

**Range:** 0 through 4095



**NOTE:** On EX Series switches and the QFX Series, the range is 0 through 4094.

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

- Related Documentation**
- *Configuring a Bridge Domain*
  - *Configuring a VLAN*
  - *Configuring VLAN Identifiers for Bridge Domains and VPLS Routing Instances*
  - *Configuring VLAN Identifiers for VLANs and VPLS Routing Instances*

## CHAPTER 10

# Bridging and VLANs Monitoring Commands

- `clear ethernet-switching table`
- `show ethernet-switching interfaces`
- `show ethernet-switching table`
- `show system statistics arp`
- `show vlans`

## clear ethernet-switching table

**Supported Platforms** EX Series, M Series, MX Series, QFabric System, QFX Series standalone switches, SRX Series

**Syntax** clear ethernet-switching table  
 <interface *interface-name*>  
 <mac *mac-address*>  
 <management-vlan>  
 <persistent-mac <*interface* | *mac-address*>>  
 <vlan *vlan-name*>

**Syntax (QFX Series)** clear ethernet-switching table  
 <interface *interface-name*>  
 <mac *mac-address*>  
 <persistent-mac <*interface* | *mac-address*>>  
 <vlan *vlan-name*>

**Release Information** Command introduced in Junos OS Release 9.3 for EX Series switches.  
 Command introduced in Junos OS Release 11.1 for the QFX Series.

**Description**



**NOTE:** On a QFabric system, using this command on an FCoE-enabled VLAN when FCoE sessions are active can cause traffic flooding and FCoE traffic drop. The FCoE sessions are not terminated and the traffic reconverges after a short period of time.

Clear learned entries, which are media access control (MAC) addresses, in the Ethernet switching table (also called the forwarding database table).

**Options** **none**—Clear learned entries in the Ethernet switching table, except for persistent MAC addresses.

**interface *interface-name***—(Optional) Clear all learned MAC addresses for the specified interface from the Ethernet switching table.

**mac *mac-address***—(Optional) Clear the specified learned MAC address from the Ethernet switching table.

**management-vlan**—(Optional) Clear all MAC addresses learned for the management VLAN from the Ethernet switching table. Note that you do not specify a VLAN name because only one management VLAN exists.

**persistent-mac <*interface* | *mac-address*>**—(Optional) Clear all MAC addresses, including persistent MAC addresses. Use the **interface** option to clear all MAC addresses on an interface, or use the **mac-address** option to clear all entries for a specific MAC address.

Use this command whenever you move a device in your network that has a persistent MAC address on the switch. If you move the device to another port on the switch and do not clear the persistent MAC address from the original port it was learned on, then the new port will not learn the MAC address and the device will not be able

to connect. If the original port is down when you move the device, then the new port will learn the MAC address and the device can connect—however, unless you cleared the MAC address on the original port, when the port comes back up, the system reinstalls the persistent MAC address in the forwarding table for that port. If this occurs, the address is removed from the new port and the device loses connectivity.

**vlan *vlan-name***—(Optional) Clear all MAC addresses learned for the specified VLAN from the Ethernet switching table.

**Required Privilege Level**

view

**Related Documentation**

- *show ethernet-switching table*
- [show ethernet-switching table on page 216](#)
- *Verifying That Persistent MAC Learning Is Working Correctly*

**List of Sample Output**    [clear ethernet-switching table on page 211](#)

**Output Fields**    This command produces no output.

## Sample Output

[clear ethernet-switching table](#)

```
user@switch> clear ethernet-switching table
```

## show ethernet-switching interfaces

**Supported Platforms** [EX4600, OCX1100, QFabric System, QFX Series standalone switches](#)

**Syntax** `show ethernet-switching interfaces`  
`<brief | detail | summary>`  
`<interface interface-name>`

**Release Information** Command introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.  
 Command introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Display information about switched Ethernet interfaces.

**Options** **none**—(Optional) Display brief information for Ethernet-switching interfaces.  
**brief | detail | summary**—(Optional) Display the specified level of output.  
**interface *interface-name***—(Optional) Display Ethernet-switching information for a specific interface.

**Required Privilege Level** view

**Related Documentation**

- [Troubleshooting Ethernet Switching on page 28](#)[Understanding Bridging and VLANs on page 7](#)
- *Example: Setting Up Basic Bridging and a VLAN on the QFX Series*
- *Example: Setting Up Bridging with Multiple VLANs*
- *Understanding FCoE*
- *Interfaces Overview*

**List of Sample Output** [show ethernet-switching interfaces on page 213](#)  
[show ethernet-switching interfaces summary on page 214](#)  
[show ethernet-switching interfaces brief on page 214](#)  
[show ethernet-switching interfaces detail on page 214](#)  
[show ethernet-switching interfaces interface-name on page 215](#)

**Output Fields** [Table 9 on page 212](#) lists the output fields for the **show ethernet-switching interfaces** command. Output fields are listed in the approximate order in which they appear.

**Table 9: show ethernet-switching interfaces Output Fields**

| Field Name | Field Description                                      | Level of Output                                     |
|------------|--------------------------------------------------------|-----------------------------------------------------|
| Interface  | Name of a switching interface.                         | All levels                                          |
| State      | Interface state. Values are <b>up</b> or <b>down</b> . | none, <b>brief</b> , <b>detail</b> , <b>summary</b> |

Table 9: show ethernet-switching interfaces Output Fields (*continued*)

| Field Name        | Field Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Level of Output                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| VLAN members      | Name of a VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | none, <b>brief</b> , <b>detail</b> , <b>summary</b> |
| Blocking          | Forwarding state of the interface: <ul style="list-style-type: none"> <li>• <b>blocked</b>—Traffic is not being forwarded on the interface.</li> <li>• <b>unblocked</b>—Traffic is forwarded on the interface.</li> <li>• <b>MAC limit exceeded</b>—The interface is temporarily disabled because of a MAC limiting error. The disabled interface is automatically restored to service when the disable timeout expires.</li> <li>• <b>MAC move limit exceeded</b>—The interface is temporarily disabled because of a MAC move limiting error. The disabled interface is automatically restored to service when the disable timeout expires.</li> <li>• <b>Storm control in effect</b> —The interface is temporarily disabled because of a storm control error. The disabled interface is automatically restored to service when the disable timeout expires.</li> <li>• <b>Storm control shutdown in effect</b> —The interface is temporarily disabled because of a storm control shutdown error. The disabled interface is automatically restored to service when the disable timeout expires.</li> </ul> | none, <b>brief</b> , <b>detail</b> , <b>summary</b> |
| Index             | VLAN index internal to Junos OS software.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>detail</b>                                       |
| untagged   tagged | Specifies whether the interface forwards IEEE802.1Q-tagged or untagged traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>detail</b>                                       |

## Sample Output

### show ethernet-switching interfaces

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

```

Interface State VLAN members Blocking
xe-0/0/0.0 up T1122 unblocked
xe-0/0/1.0 down default - MAC limit exceeded
xe-0/0/2.0 down default - MAC move limit exceeded
xe-0/0/3.0 down default - Storm control in effect
xe-0/0/4.0 down default unblocked
xe-0/0/5.0 down default unblocked
xe-0/0/6.0 down default unblocked
xe-0/0/7.0 down default unblocked
xe-0/0/8.0 down default unblocked
xe-0/0/9.0 up T111 unblocked
xe-0/0/10.0 down default unblocked
xe-0/0/11.0 down default unblocked
xe-0/0/12.0 down default unblocked
xe-0/0/13.0 down default unblocked
xe-0/0/14.0 down default unblocked
xe-0/0/15.0 down default unblocked
xe-0/0/16.0 down default unblocked
xe-0/0/17.0 down default unblocked
xe-0/0/18.0 down default unblocked
xe-0/0/19.0 up T111 unblocked
xe-0/1/0.0 down default unblocked
xe-0/1/1.0 down default unblocked

```

|            |      |         |           |
|------------|------|---------|-----------|
| xe-0/1/2.0 | down | default | unblocked |
| xe-0/1/3.0 | down | default | unblocked |

### show ethernet-switching interfaces summary

```
user@switch> show ethernet-switching interfaces summary
xe-0/0/0.0
xe-0/0/1.0
xe-0/0/2.0
xe-0/0/3.0
xe-0/0/8.0
xe-0/0/10.0
xe-0/0/11.0
```

### show ethernet-switching interfaces brief

```
user@switch> show ethernet-switching interfaces brief
Interface State VLAN members Blocking
xe-0/0/0.0 down default unblocked
xe-0/0/1.0 down employee-vlan unblocked
xe-0/0/2.0 down employee-vlan unblocked
xe-0/0/3.0 down employee-vlan unblocked
xe-0/0/8.0 down employee-vlan unblocked
xe-0/0/10.0 down default unblocked
xe-0/0/11.0 down employee-vlan unblocked
```

### show ethernet-switching interfaces detail

```
user@switch> show ethernet-switching interfaces detail
Interface: xe-0/0/0.0 Index: 65
State: down
VLANs:
 default untagged unblocked

Interface: xe-0/0/1.0 Index: 66
State: down
VLANs:
 employee-vlan untagged unblocked

Interface: xe-0/0/2.0 Index: 67
State: down
VLANs:
 employee-vlan untagged unblocked

Interface: xe-0/0/3.0 Index: 68
State: down
VLANs:
 employee-vlan untagged unblocked

Interface: xe-0/0/8.0 Index: 69
State: down
VLANs:
 employee-vlan untagged unblocked

Interface: xe-0/0/10.0 Index: 70
State: down
VLANs:
 default untagged unblocked

Interface: xe-0/0/11.0 Index: 71
State: down
```



```
VLANs:
 employee-vlan tagged unblocked
```

**show ethernet-switching interfaces interface-name**

```
user@switch> show ethernet-switching interfaces xe-0/0/0.0
 Interface State VLAN members Blocking
xe-0/0/0.0 down default unblocked
```

## show ethernet-switching table

---

**Supported Platforms** [EX4600, QFabric System, QFX Series standalone switches](#)

**Syntax** `show ethernet-switching table`  
`<brief | detail | extensive | summary>`  
`<interface interface-name>`  
`<management-vlan>`  
`<sort-by (name | tag)>`  
`<vlan vlan-name>`

**Release Information** Command introduced in Junos OS Release 11.1 for the QFX Series.  
Output for private VLANs introduced in Junos OS Release 12.1 for the QFX Series.

**Description** Displays the Ethernet switching table.

**Options** `none`—(Optional) Display brief information about the Ethernet switching table.

`brief | detail | extensive | summary`—(Optional) Display the specified level of output.

`interface interface-name`—(Optional) Display the Ethernet switching table for a specific interface.

`management-vlan`—(Optional) Display the Ethernet switching table for a management VLAN.

`sort-by (name | tag)`—(Optional) Display VLANs in ascending order of VLAN IDs or VLAN names.

`vlan vlan-name`—(Optional) Display the Ethernet switching table for a specific VLAN.

**Required Privilege Level** view

**Related Documentation**

- [Example: Setting Up Basic Bridging and a VLAN on the QFX Series](#)
- [Example: Setting Up Bridging with Multiple VLANs](#)

**List of Sample Output** [show ethernet-switching table \(Enhanced Layer 2 Software\) on page 217](#)  
[show ethernet-switching table on page 218](#)  
[show ethernet-switching table \(Private VLANs\) on page 219](#)  
[show ethernet-switching table brief on page 219](#)  
[show ethernet-switching table detail on page 220](#)  
[show ethernet-switching table extensive on page 221](#)  
[show ethernet-switching table interface on page 223](#)

**Output Fields** [Table 10 on page 217](#) lists the output fields for the `show ethernet-switching table` command. Output fields are listed in the approximate order in which they appear.

Table 10: show ethernet-switching table Output Fields

| Field Name         | Field Description                                                                                                                                                                                                                                                                                             | Level of Output          |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>VLAN</b>        | Name of a VLAN.                                                                                                                                                                                                                                                                                               | All levels               |
| <b>MAC address</b> | MAC address associated with the VLAN.                                                                                                                                                                                                                                                                         | All levels               |
| <b>Type</b>        | Type of MAC address: <ul style="list-style-type: none"> <li>• <b>static</b>—The MAC address is manually created.</li> <li>• <b>learn</b>—The MAC address is learned dynamically from a packet's source MAC address.</li> <li>• <b>flood</b>—The MAC address is unknown and flooded to all members.</li> </ul> | All levels               |
| <b>Age</b>         | Time remaining before the entry ages out and is removed from the Ethernet switching table.                                                                                                                                                                                                                    | All levels               |
| <b>Interfaces</b>  | Interface associated with learned MAC addresses or with the <b>All-members</b> option (flood entry).                                                                                                                                                                                                          | All levels               |
| <b>Learned</b>     | For learned entries, the time at which the entry was added to the Ethernet switching table.                                                                                                                                                                                                                   | <b>detail, extensive</b> |

## Sample Output

### show ethernet-switching table (Enhanced Layer 2 Software)

```
user@switch> show ethernet-switching table
MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
 SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
0 - ovsdb MAC)
```

```
Ethernet switching table : 2 entries, 2 learned
```

```
Routing instance : default-switch
```

| Vlan<br>name | MAC<br>address    | MAC<br>flags | Age | Logical<br>interface |
|--------------|-------------------|--------------|-----|----------------------|
| vlan1        | b0:c6:9a:ca:3c:01 | D            | -   | ae1.0                |
| vlan1        | b0:c6:9a:ca:3c:03 | D            | -   | ae1.0                |

```
MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
```

```
 SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
0 - ovsdb MAC)
```

```
Ethernet switching table : 2 entries, 2 learned
```

```
Routing instance : default-switch
```

| Vlan<br>name | MAC<br>address    | MAC<br>flags | Age | Logical<br>interface |
|--------------|-------------------|--------------|-----|----------------------|
| vlan10       | b0:c6:9a:ca:3c:01 | D            | -   | ae1.0                |
| vlan10       | b0:c6:9a:ca:3c:03 | D            | -   | ae1.0                |

MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent static

SE - statistics enabled, NM - non configured MAC, R - remote PE MAC, 0 - ovsdb MAC)

Ethernet switching table : 2 entries, 2 learned

Routing instance : default-switch

| Vlan<br>name | MAC<br>address    | MAC<br>flags | Age | Logical<br>interface |
|--------------|-------------------|--------------|-----|----------------------|
| vlan2        | b0:c6:9a:ca:3c:01 | D            | -   | ae1.0                |
| vlan2        | b0:c6:9a:ca:3c:03 | D            | -   | ae1.0                |

MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent static

SE - statistics enabled, NM - non configured MAC, R - remote PE MAC, 0 - ovsdb MAC)

Ethernet switching table : 2 entries, 2 learned

Routing instance : default-switch

| Vlan<br>name | MAC<br>address    | MAC<br>flags | Age | Logical<br>interface |
|--------------|-------------------|--------------|-----|----------------------|
| vlan3        | b0:c6:9a:ca:3c:01 | D            | -   | ae1.0                |
| vlan3        | b0:c6:9a:ca:3c:03 | D            | -   | ae1.0                |

MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent static

SE - statistics enabled, NM - non configured MAC, R - remote PE MAC, 0 - ovsdb MAC)

Ethernet switching table : 2 entries, 2 learned

Routing instance : default-switch

| Vlan<br>name | MAC<br>address    | MAC<br>flags | Age | Logical<br>interface |
|--------------|-------------------|--------------|-----|----------------------|
| vlan4        | b0:c6:9a:ca:3c:01 | D            | -   | ae1.0                |
| vlan4        | b0:c6:9a:ca:3c:03 | D            | -   | ae1.0                |

### show ethernet-switching table

user@switch> show ethernet-switching table

Ethernet-switching table: 57 entries, 17 learned

| VLAN  | MAC address       | Type   | Age | Interfaces  |
|-------|-------------------|--------|-----|-------------|
| F2    | *                 | Flood  | -   | All-members |
| F2    | 00:00:05:00:00:03 | Learn  | 0   | xe-0/0/44.0 |
| F2    | 00:19:e2:50:7d:e0 | Static | -   | Router      |
| Linux | *                 | Flood  | -   | All-members |
| Linux | 00:19:e2:50:7d:e0 | Static | -   | Router      |
| Linux | 00:30:48:90:54:89 | Learn  | 0   | xe-0/0/47.0 |
| T1    | *                 | Flood  | -   | All-members |
| T1    | 00:00:05:00:00:01 | Learn  | 0   | xe-0/0/46.0 |
| T1    | 00:00:5e:00:01:00 | Static | -   | Router      |
| T1    | 00:19:e2:50:63:e0 | Learn  | 0   | xe-0/0/46.0 |

```

T1 00:19:e2:50:7d:e0 Static - Router
T10 * Flood - All-members
T10 00:00:5e:00:01:09 Static - Router
T10 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T10 00:19:e2:50:7d:e0 Static - Router
T111 * Flood - All-members
T111 00:19:e2:50:63:e0 Learn 0 xe-0/0/15.0
T111 00:19:e2:50:7d:e0 Static - Router
T111 00:19:e2:50:ac:00 Learn 0 xe-0/0/15.0
T2 * Flood - All-members
T2 00:00:5e:00:01:01 Static - Router
T2 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T2 00:19:e2:50:7d:e0 Static - Router
T3 * Flood - All-members
T3 00:00:5e:00:01:02 Static - Router
T3 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T3 00:19:e2:50:7d:e0 Static - Router
T4 * Flood - All-members
T4 00:00:5e:00:01:03 Static - Router
T4 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
[output truncated]

```

### show ethernet-switching table (Private VLANs)

```

user@switch> show ethernet-switching table
Ethernet-switching table: 10 entries, 3 learned
VLAN MAC address Type Age Interfaces
pvlan * Flood - All-members
pvlan 00:10:94:00:00:02 Replicated - xe-0/0/28.0
pvlan 00:10:94:00:00:35 Replicated - xe-0/0/46.0
pvlan 00:10:94:00:00:46 Replicated - xe-0/0/4.0
c2 * Flood - All-members
c2 00:10:94:00:00:02 Learn 0 xe-0/0/28.0
c1 * Flood - All-members
c1 00:10:94:00:00:46 Learn 0 xe-0/0/4.0
__pvlan_pvlan_xe-0/0/46.0__ * Flood - All-members
__pvlan_pvlan_xe-0/0/46.0__ 00:10:94:00:00:35 Learn 0 xe-0/0/46.0

```

### show ethernet-switching table brief

```

user@switch> show ethernet-switching table brief
Ethernet-switching table: 57 entries, 17 learned
VLAN MAC address Type Age Interfaces
F2 * Flood - All-members
F2 00:00:05:00:00:03 Learn 0 xe-0/0/44.0
F2 00:19:e2:50:7d:e0 Static - Router
Linux * Flood - All-members
Linux 00:19:e2:50:7d:e0 Static - Router
Linux 00:30:48:90:54:89 Learn 0 xe-0/0/47.0
T1 * Flood - All-members
T1 00:00:05:00:00:01 Learn 0 xe-0/0/46.0
T1 00:00:5e:00:01:00 Static - Router
T1 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T1 00:19:e2:50:7d:e0 Static - Router
T10 * Flood - All-members
T10 00:00:5e:00:01:09 Static - Router
T10 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T10 00:19:e2:50:7d:e0 Static - Router
T111 * Flood - All-members
T111 00:19:e2:50:63:e0 Learn 0 xe-0/0/15.0
T111 00:19:e2:50:7d:e0 Static - Router

```

```

T111 00:19:e2:50:ac:00 Learn 0 xe-0/0/15.0
T2 * Flood - All-members
T2 00:00:5e:00:01:01 Static - Router
T2 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T2 00:19:e2:50:7d:e0 Static - Router
T3 * Flood - All-members
T3 00:00:5e:00:01:02 Static - Router
T3 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0
T3 00:19:e2:50:7d:e0 Static - Router
T4 * Flood - All-members
T4 00:00:5e:00:01:03 Static - Router
T4 00:19:e2:50:63:e0 Learn 0 xe-0/0/46.0

```

[output truncated]

### show ethernet-switching table detail

```

user@switch> show ethernet-switching table detail
Ethernet-switching table: 57 entries, 17 learned
F2, *
 Interface(s): xe-0/0/44.0
 Type: Flood
 Nexthop index: 0

F2, 00:00:05:00:00:03
 Interface(s): xe-0/0/44.0
 Type: Learn, Age: 0, Learned: 2:03:09
 Nexthop index: 0

F2, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

Linux, *
 Interface(s): xe-0/0/47.0
 Type: Flood
 Nexthop index: 0

Linux, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

Linux, 00:30:48:90:54:89
 Interface(s): xe-0/0/47.0
 Type: Learn, Age: 0, Learned: 2:03:08
 Nexthop index: 0

T1, *
 Interface(s): xe-0/0/46.0
 Type: Flood
 Nexthop index: 0

T1, 00:00:05:00:00:01
 Interface(s): xe-0/0/46.0
 Type: Learn, Age: 0, Learned: 2:03:07
 Nexthop index: 0

T1, 00:00:5e:00:01:00
 Interface(s): Router
 Type: Static

```

```

 Nexthop index: 0

T1, 00:19:e2:50:63:e0
 Interface(s): xe-0/0/46.0
 Type: Learn, Age: 0, Learned: 2:03:07
 Nexthop index: 0

T1, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T10, *
 Interface(s): xe-0/0/46.0
 Type: Flood
 Nexthop index: 0

T10, 00:00:5e:00:01:09
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T10, 00:19:e2:50:63:e0
 Interface(s): xe-0/0/46.0
 Type: Learn, Age: 0, Learned: 2:03:08
 Nexthop index: 0

T10, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T111, *
 Interface(s): xe-0/0/15.0
 Type: Flood
 Nexthop index: 0
[output truncated]

```

#### show ethernet-switching table extensive

```

user@switch> show ethernet-switching table extensive
Ethernet-switching table: 57 entries, 17 learned
F2, *
 Interface(s): xe-0/0/44.0
 Type: Flood
 Nexthop index: 0

F2, 00:00:05:00:00:03
 Interface(s): xe-0/0/44.0
 Type: Learn, Age: 0, Learned: 2:03:09
 Nexthop index: 0

F2, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

Linux, *
 Interface(s): xe-0/0/47.0
 Type: Flood
 Nexthop index: 0

```

```
Linux, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

Linux, 00:30:48:90:54:89
 Interface(s): xe-0/0/47.0
 Type: Learn, Age: 0, Learned: 2:03:08
 Nexthop index: 0

T1, *
 Interface(s): xe-0/0/46.0
 Type: Flood
 Nexthop index: 0

T1, 00:00:05:00:00:01
 Interface(s): xe-0/0/46.0
 Type: Learn, Age: 0, Learned: 2:03:07
 Nexthop index: 0

T1, 00:00:5e:00:01:00
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T1, 00:19:e2:50:63:e0
 Interface(s): xe-0/0/46.0
 Type: Learn, Age: 0, Learned: 2:03:07
 Nexthop index: 0

T1, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T10, *
 Interface(s): xe-0/0/46.0
 Type: Flood
 Nexthop index: 0

T10, 00:00:5e:00:01:09
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T10, 00:19:e2:50:63:e0
 Interface(s): xe-0/0/46.0
 Type: Learn, Age: 0, Learned: 2:03:08
 Nexthop index: 0

T10, 00:19:e2:50:7d:e0
 Interface(s): Router
 Type: Static
 Nexthop index: 0

T111, *
 Interface(s): xe-0/0/15.0
 Type: Flood
 Nexthop index: 0
[output truncated]
```



### show ethernet-switching table interface

```
user@switch> show ethernet-switching table interface xe-0/0/1
Ethernet-switching table: 1 unicast entries
VLAN MAC address Type Age Interfaces
V1 * Flood - - All-members
V1 00:00:05:00:00:05 Learn 0 xe-0/0/1.0
```

## show system statistics arp

---

|                                 |                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFabric System, QFX Series standalone switches                                                                                                                                                   |
| <b>Syntax</b>                   | show system statistics arp                                                                                                                                                                                  |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.6 for EX Series switches.                                                                                                                                          |
| <b>Description</b>              | Display system-wide Address Resolution Protocol (ARP) statistics.                                                                                                                                           |
| <b>Required Privilege Level</b> | view                                                                                                                                                                                                        |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">Example: Configuring Proxy ARP on an EX Series Switch</a></li><li>• <a href="#">Verifying That Proxy ARP Is Working Correctly on page 101</a></li></ul> |

## show system statistics arp

```
user@switch> show system statistics arp
arp:
 90060 datagrams received
 34 ARP requests received
 610 ARP replies received
 0 resolution request received
 0 unrestricted proxy requests
 0 restricted proxy requests
 0 received proxy requests
 0 unrestricted proxy requests not proxied
 0 restricted proxy requests not proxied
 0 datagrams with bogus interface
 0 datagrams with incorrect length
 0 datagrams for non-IP protocol
 0 datagrams with unsupported op code
 0 datagrams with bad protocol address length
 0 datagrams with bad hardware address length
 0 datagrams with multicast source address
 0 datagrams with multicast target address
 0 datagrams with my own hardware address
 0 datagrams for an address not on the interface
 0 datagrams with a broadcast source address
 294 datagrams with source address duplicate to mine
 89113 datagrams which were not for me
 0 packets discarded waiting for resolution
 0 packets sent after waiting for resolution
 309 ARP requests sent
 35 ARP replies sent
 0 requests for memory denied
 0 requests dropped on entry
 0 requests dropped during retry
 0 requests dropped due to interface deletion
 0 requests on unnumbered interfaces
 0 new requests on unnumbered interfaces
 0 replies for from unnumbered interfaces
 0 requests on unnumbered interface with non-subnetted donor
 0 replies from unnumbered interface with non-subnetted donor
```

## show vlans

**Supported Platforms** EX4600, QFabric System, QFX Series standalone switches

**Syntax** `show vlans`  
`<brief | detail | extensive>`  
`<dot1q-tunneling>`  
`<sort-by (tag | name)>`  
`<vlan-range-name>`

**Release Information** Command introduced in Junos OS Release 11.1 for the QFX Series.  
Option **dot1q-tunneling** added in Junos OS Release 12.1 for the QFX Series.

**Description** Display information about VLANs configured on bridged Ethernet interfaces. For interfaces configured to support a VoIP VLAN and a data VLAN, the **show vlans** command displays both tagged and untagged membership for those VLANs.



**NOTE:** When a series of VLANs is created using the `vlan-range` statement, such VLAN names are preceded and followed by a double underscore. For example, a series of VLANs using the VLAN range 1 through 3 and the base VLAN name `marketing` would be displayed as `__marketing_1__`, `__marketing_2__`, and `__marketing_3__`.



**NOTE:** To display an 802.1X supplicant successfully authenticated in multiple-supplicant mode with dynamic VLAN movement, use the `show vlans vlan-name extensive` operational mode command, where `vlan-name` is the dynamic VLAN.

**Options** **none**—Display information for all VLANs. VLAN information is displayed by VLAN name in ascending order.

**brief | detail | extensive**—(Optional) Display the specified level of output.

**sort-by (tag | name)**—(Optional) Display VLANs in ascending order of VLAN IDs or VLAN names.

**vlan-range-name**—(Optional) Display VLANs in ascending order of VLAN range names.

**Required Privilege Level** view

**Related Documentation**

- *Example: Setting Up Basic Bridging and a VLAN on the QFX Series*
- *Example: Setting Up Bridging with Multiple VLANs*
- *Understanding Bridging and VLANs*

- [show ethernet-switching interfaces on page 212](#)

**List of Sample Output**

- [show vlans on page 228](#)
- [show vlans \(Private VLANs\) on page 228](#)
- [show vlans brief on page 229](#)
- [show vlans detail on page 229](#)
- [show vlans extensive \(Port-Based\) on page 230](#)
- [show vlans \(Q-in-Q Tunneling\) on page 231](#)
- [show vlans extensive \(Q-in-Q Tunneling\) on page 231](#)
- [show vlans extensive \(Q-in-Q Tunneling and L2TP\) on page 231](#)
- [show vlans sort-by tag on page 231](#)
- [show vlans sort-by name on page 232](#)
- [show vlans tag on page 233](#)

**Output Fields** [Table 11 on page 226](#) lists the output fields for the **show vlans** command. Output fields are listed in the approximate order in which they appear.

**Table 11: show vlans Output Fields**

| Field Name                  | Field Description                                                                                                                                                            | Level of Output          |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Name</b>                 | Name of a VLAN.                                                                                                                                                              | none, <b>brief</b>       |
| <b>Tag</b>                  | 802.1Q tag applied to this VLAN. If <b>none</b> is displayed, no tag is applied.                                                                                             | All levels               |
| <b>Interfaces</b>           | Interface associated with learned MAC addresses or <b>All-members</b> option (flood entry). An asterisk (*) beside the interface indicates that the interface is <b>UP</b> . | All levels               |
| <b>Address</b>              | IP address.                                                                                                                                                                  | none, <b>brief</b>       |
| <b>Ports Active /Total</b>  | Number of interfaces associated with a VLAN: <b>Active</b> indicates interfaces that are <b>UP</b> , and <b>Total</b> indicates interfaces that are active and inactive.     | <b>brief</b>             |
| <b>VLAN</b>                 | Name of a VLAN.                                                                                                                                                              | <b>detail, extensive</b> |
| <b>Admin state</b>          | State of the interface. Values are:<br><br><b>enabled</b> —The interface is turned on, and the physical link is operational and can pass packets.                            | <b>detail,extensive</b>  |
| <b>MAC learning Status</b>  | Indicates if MAC learning is disabled.                                                                                                                                       | <b>detail, extensive</b> |
| <b>Description</b>          | Description for the VLAN.                                                                                                                                                    | <b>detail,extensive</b>  |
| <b>Primary IP</b>           | Primary IP address associated with a VLAN.                                                                                                                                   | <b>detail</b>            |
| <b>Number of interfaces</b> | Number of interfaces associated with a VLAN. Both the total number of interfaces and the number of active interfaces associated with a VLAN are displayed.                   | <b>detail, extensive</b> |
| <b>STP</b>                  | Spanning tree associated with a VLAN.                                                                                                                                        | <b>detail,extensive</b>  |

Table 11: show vlans Output Fields (*continued*)

| Field Name                     | Field Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Level of Output          |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Tagged interfaces</b>       | Tagged interfaces with which a VLAN is associated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>detail,extensive</b>  |
| <b>Untagged interfaces</b>     | Untagged interfaces with which a VLAN is associated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>detail. extensive</b> |
| <b>Dot1q Tunneling Status</b>  | Indicates if Q-in-Q tunneling is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>extensive</b>         |
| <b>Customer VLAN ranges</b>    | List of customer VLAN (C-VLAN) ranges associated with this service VLAN (S-VLAN).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>extensive</b>         |
| <b>Private VLAN Mode</b>       | The private VLAN mode for this VLAN. Values include <b>Primary</b> , <b>Isolated</b> , and <b>Community</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>extensive</b>         |
| <b>Primary VLAN</b>            | Primary VLAN tag for this secondary VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>extensive</b>         |
| <b>Internal Index</b>          | VLAN index internal to Junos OS software.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>extensive</b>         |
| <b>Origin</b>                  | Manner in which the VLAN was created: <b>static</b> or <b>learn</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>extensive</b>         |
| <b>Protocol</b>                | Port-based VLAN or MAC-based VLAN. MAC-based protocol is displayed when VLAN assignment is done either statically or dynamically through 802.1X,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>extensive</b>         |
| <b>IP addresses</b>            | IP address associated with a VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>extensive</b>         |
| <b>Number of MAC entries</b>   | For MAC-based VLANs created either statically or dynamically, the MAC addresses associated with an interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>extensive</b>         |
| <b>Number of mapping rules</b> | Number of mapping rules for Q-in-Q tunneling ( <b>Push</b> ) and VLAN translation ( <b>Swap</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                          |
| <b>Secondary VLANs</b>         | Secondary VLANs associated with a primary VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>extensive</b>         |
| <b>Isolated VLANs</b>          | Isolated VLANs associated with a primary VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>extensive</b>         |
| <b>Community VLANs</b>         | Community VLANs associated with a primary VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>extensive</b>         |
| <b>VLANs summary</b>           | VLAN counts: <ul style="list-style-type: none"> <li>• <b>Total</b>—Total number of VLANs on the switch.</li> <li>• <b>Configured VLANs</b>—Number of VLANs that are based on user-configured settings.</li> <li>• <b>Internal VLANs</b>—Number of VLANs created by the system with no explicit configuration or protocol—for example, the <b>default</b> VLAN and the VLAN created when a trunk interface is not configured with native VLAN membership.</li> <li>• <b>Temporary VLANs</b>—Number of VLANs from the previous configuration that the system retains for a limited time after restart. Temporary VLANs are converted into one of the other types of VLAN, or are removed from the system if the current configuration does not require them.</li> </ul> | All levels               |

Table 11: show vlans Output Fields (*continued*)

| Field Name                          | Field Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Level of Output |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Dot1q VLANs summary</b>          | 802.1Q VLAN counts: <ul style="list-style-type: none"> <li>• <b>Total</b>—Total number of 802.1Q-tagged and untagged VLANs on the switch.</li> <li>• <b>Tagged VLANs</b>—Number of 802.1Q-tagged VLANs.</li> <li>• <b>Untagged VLANs</b>—Number of untagged 802.1Q VLANs.</li> <li>• <b>Private VLAN</b>—Counts of the following kinds of 802.1Q private VLANs (PVLANS):               <ul style="list-style-type: none"> <li>• <b>Primary VLANs</b>—Number of primary forwarding private VLANs.</li> <li>• <b>Community VLANs</b>—Number of community transporting and forwarding private VLANs.</li> <li>• <b>Isolated VLANs</b>—Number of isolated receiving and forwarding private VLANs.</li> <li>• <b>Inter-switch-isolated VLANs</b>—Number of inter-switch isolated receiving and forwarding private VLANs.</li> </ul> </li> </ul> | All levels      |
| <b>Dot1q Tunneled VLANs summary</b> | Q-in-Q-tunneled VLAN counts: <ul style="list-style-type: none"> <li>• <b>Total</b>—Total number of Q-in-Q-tunneled VLANs on the switch.</li> <li>• <b>Private VLAN</b>—Counts of primary, community, and isolated Q-in-Q-tunneled private VLANs (PVLANS).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | All levels      |

## Sample Output

### show vlans

```
user@switch> show vlans
```

| Name    | Tag  | Interfaces                                                                                                                                                                                                                                                                                           |
|---------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| default | None | xe-0/0/34.0, xe-0/0/33.0, xe-0/0/32.0, xe-0/0/31.0, xe-0/0/30.0, xe-0/0/29.0, xe-0/0/28.0, xe-0/0/27.0, xe-0/0/26.0, xe-0/0/25.0, xe-0/0/19.0, xe-0/0/18.0, xe-0/0/17.0, xe-0/0/16.0, xe-0/0/15.0, xe-0/0/14.0, xe-0/0/13.0, xe-0/0/11.0, xe-0/0/9.0, xe-0/0/8.0, xe-0/0/3.0, xe-0/0/2.0, xe-0/0/1.0 |
| v0001   | 1    | xe-0/0/24.0, xe-0/0/23.0, xe-0/0/22.0, xe-0/0/21.0                                                                                                                                                                                                                                                   |
| v0002   | 2    | None                                                                                                                                                                                                                                                                                                 |
| v0003   | 3    | None                                                                                                                                                                                                                                                                                                 |
| v0004   | 4    | None                                                                                                                                                                                                                                                                                                 |
| v0005   | 5    | None                                                                                                                                                                                                                                                                                                 |

### show vlans (Private VLANs)

```
user@switch> show vlans
```

| Name                        | Tag | Interfaces |
|-----------------------------|-----|------------|
| __pvlan_pvlan_xe-0/0/46.0__ |     |            |

```

c1 xe-0/0/44.0*, xe-0/0/46.0*
c2 xe-0/0/4.0*, xe-0/0/44.0*
default xe-0/0/28.0*, xe-0/0/44.0*
pvlan 500
 None
 xe-0/0/4.0*, xe-0/0/28.0*, xe-0/0/44.0*, xe-0/0/46.0*

```

### show vlans brief

```
user@switch> show vlans brief
```

| Name    | Tag  | Address | Ports<br>Active/Total |
|---------|------|---------|-----------------------|
| default | None |         | 0/23                  |
| v0001   | 1    |         | 0/4                   |
| v0002   | 2    |         | 0/0                   |
| v0003   | 3    |         | 0/0                   |
| v0004   | 4    |         | 0/0                   |
| v0005   | 5    |         | 0/0                   |
| v0006   | 6    |         | 0/0                   |
| v0007   | 7    |         | 0/0                   |
| v0008   | 8    |         | 0/0                   |
| v0009   | 9    |         | 0/0                   |
| v0010   | 10   |         | 0/2                   |
| v0011   | 11   |         | 0/0                   |
| v0012   | 12   |         | 0/0                   |
| v0013   | 13   |         | 0/0                   |
| v0014   | 14   |         | 0/0                   |
| v0015   | 15   |         | 0/0                   |
| v0016   | 16   |         | 0/0                   |

### show vlans detail

```
user@switch> show vlans detail
```

```
VLAN: default, Tag: Untagged, Admin state: Enabled
```

```
Description: None
```

```
Primary IP: None, Number of interfaces: 23 (Active = 0)
```

```
STP: None, RTG: None
```

```
Untagged interfaces: xe-0/0/34.0, xe-0/0/33.0, xe-0/0/32.0, xe-0/0/31.0,
xe-0/0/30.0, xe-0/0/29.0, xe-0/0/28.0, xe-0/0/27.0, xe-0/0/26.0,
xe-0/0/25.0, xe-0/0/19.0, xe-0/0/18.0, xe-0/0/17.0, xe-0/0/16.0,
xe-0/0/15.0, xe-0/0/14.0, xe-0/0/13.0, xe-0/0/11.0, xe-0/0/9.0, xe-0/0/8.0,
xe-0/0/3.0, xe-0/0/2.0, xe-0/0/1.0,
```

```
Tagged interfaces: None
```

```
VLAN: v0001, Tag: 802.1Q Tag 1, Admin state: Enabled
```

```
Description: None
```

```
Primary IP: None, Number of interfaces: 4 (Active = 0)
```

```
Dot1q Tunneling Status: Enabled
```

```
STP: None, RTG: None
```

```
Untagged interfaces: None
```

```
Tagged interfaces: xe-0/0/24.0, xe-0/0/23.0, xe-0/0/22.0, xe-0/0/21.0,
```

```
VLAN: v0002, Tag: 802.1Q Tag 2, Admin state: Enabled
```

```
Description: None
```

```
Primary IP: None, Number of interfaces: 0 (Active = 0)
```

```
STP: None, RTG: None
```

```
Untagged interfaces: None
```

```
Tagged interfaces: None
```

```
VLAN: v0003, Tag: 802.1Q Tag 3, Admin state: Enabled
Description: None
Primary IP: None, Number of interfaces: 0 (Active = 0)
STP: None, RTG: None
Untagged interfaces: None
Tagged interfaces: None

VLAN: vlan4000, 802.1Q Tag: Untagged, Admin State: Enabled
MAC learning Status: Disabled
Number of interfaces: 0 (Active = 0)
```

### show vlans extensive (Port-Based)

```
user@switch> show vlans extensive
VLAN: default, created at Mon Feb 4 12:13:47 2008
Tag: None, Internal index: 0, Admin state: Enabled, Origin: static
Description: None
Customer VLAN ranges:
 1-4100
Protocol: Port based
IP addresses: None
STP: None, RTG: None.
Number of interfaces: Tagged 0 (Active = 0), Untagged 23 (Active = 0)
 xe-0/0/34.0 (untagged, access)
 xe-0/0/33.0 (untagged, access)
 xe-0/0/32.0 (untagged, access)
 xe-0/0/31.0 (untagged, access)
 xe-0/0/30.0 (untagged, access)
 xe-0/0/29.0 (untagged, access)
 xe-0/0/28.0 (untagged, access)
 xe-0/0/27.0 (untagged, access)
 xe-0/0/26.0 (untagged, access)
 xe-0/0/25.0 (untagged, access)
 xe-0/0/19.0 (untagged, access)
 xe-0/0/18.0 (untagged, access)
 xe-0/0/17.0 (untagged, access)
 xe-0/0/16.0 (untagged, access)
 xe-0/0/15.0 (untagged, access)
 xe-0/0/14.0 (untagged, access)
 xe-0/0/13.0 (untagged, access)
 xe-0/0/11.0 (untagged, access)
 xe-0/0/9.0 (untagged, access)
 xe-0/0/8.0 (untagged, access)
 xe-0/0/3.0 (untagged, access)
 xe-0/0/2.0 (untagged, access)
 xe-0/0/1.0 (untagged, access)

Secondary VLANs: Isolated 1, Community 1
Isolated VLANs :
 __pvlan_pvlan_xe-0/0/3.0__
Community VLANs :
 comm1

VLAN: v0001, created at Mon Feb 4 12:13:47 2008
Tag: 1, Internal index: 1, Admin state: Enabled, Origin: static
Description: None
Protocol: Port based, Layer 3 interface: None
IP addresses: None
STP: None, RTG: None.
Number of interfaces: Tagged 4 (Active = 0), Untagged 0 (Active = 0)
```



```

xe-0/0/24.0 (tagged, trunk)
xe-0/0/23.0 (tagged, trunk)
xe-0/0/22.0 (tagged, trunk)
xe-0/0/21.0 (tagged, trunk)

```

```

VLAN: v0002, created at Mon Feb 4 12:13:47 2008
Tag: 2, Internal index: 2, Admin state: Enabled, Origin: static
Description: None
Protocol: Port based, Layer 3 interface: None
IP addresses: None
STP: None, RTG: None.
Number of interfaces: Tagged 0 (Active = 0), Untagged 0 (Active = 0)
None

```

```

VLAN: v0003, created at Mon Feb 4 12:13:47 2008
Tag: 3, Internal index: 3, Admin state: Enabled, Origin: static
Description: None
Protocol: Port based, Layer 3 interface: None
IP addresses: None
STP: None, RTG: None.
Number of interfaces: Tagged 0 (Active = 0), Untagged 0 (Active = 0)
None

```

### show vlans (Q-in-Q Tunneling)

```

user@switch> show vlans dot1q-tunneling
Name Tag Interfaces
sv100 100 xe-0/0/4.0*, xe-0/0/15.0*

```

### show vlans extensive (Q-in-Q Tunneling)

```

user@switch> show vlans sv100 extensive
VLAN: sv100, Created at: Sat Sep 10 12:53:52 2011
802.1Q Tag: 100, Internal index: 2, Admin State: Enabled, Origin: Static
Dot1q Tunneling Status: Enabled
Customer VLAN ranges:
 10-20
 40-50
Protocol: Port Mode
Number of interfaces: Tagged 1 (Active = 1), Untagged 0 (Active = 0)
 ge-0/0/0.0, tagged, trunk

Number of mapping rules:
 Push 1 (Active = 0), Policy 0 (Active = 0), Swap 0 (Active = 0)

 xe-0/0/3.0*, 300, push

```

### show vlans extensive (Q-in-Q Tunneling and L2TP)

```

user@switch> show vlans v1 extensive
VLAN: v1, Created at: Fri Mar 2 05:07:38 2012
802.1Q Tag: 100, Internal index: 4, Admin State: Enabled, Origin: Static
Dot1q Tunneling status: Enabled
Layer2 Protocol Tunneling status: Enabled

```

### show vlans sort-by tag

```

user@switch> show vlans sort-by tag
Name Tag Interfaces
default None
__vlan-x_1__ 1

```

|               |    |      |
|---------------|----|------|
| __vlan-x_2__  | 2  | None |
| __vlan-x_3__  | 3  | None |
| __vlan-x_4__  | 4  | None |
| __vlan-x_5__  | 5  | None |
| __vlan-x_6__  | 6  | None |
| __vlan-x_7__  | 7  | None |
| __vlan-x_8__  | 8  | None |
| __vlan-x_9__  | 9  | None |
| __vlan-x_10__ | 10 | None |
| __vlan-x_11__ | 11 | None |
| __vlan-x_12__ | 12 | None |
| __vlan-x_13__ | 13 | None |
| __vlan-x_14__ | 14 | None |
| __vlan-x_15__ | 15 | None |
| __vlan-x_16__ | 16 | None |
| __vlan-x_17__ | 17 | None |
| __vlan-x_18__ | 18 | None |
| __vlan-x_19__ | 19 | None |
| __vlan-x_20__ | 20 | None |

**show vlans sort-by name**

```
user@switch> show vlans sort-by employee
```

| Name             | Tag | Interfaces   |
|------------------|-----|--------------|
| __employee_120__ | 120 | xe-0/0/22.0* |
| __employee_121__ | 121 | xe-0/0/22.0* |
| __employee_122__ | 122 | xe-0/0/22.0* |
| __employee_123__ | 123 | xe-0/0/22.0* |
| __employee_124__ | 124 | xe-0/0/22.0* |
| __employee_125__ | 125 | xe-0/0/22.0* |
| __employee_126__ | 126 | xe-0/0/22.0* |
| __employee_127__ | 127 | xe-0/0/22.0* |

```

__employee_128__ 128 xe-0/0/22.0*
__employee_129__ 129 xe-0/0/22.0*
__employee_130__ 130 xe-0/0/22.0*

```

### show vlans tag

```
user@switch> show vlans employee
```

| Name             | Tag | Interfaces   |
|------------------|-----|--------------|
| __employee_120__ | 120 | xe-0/0/22.0* |
| __employee_121__ | 121 | xe-0/0/22.0* |
| __employee_122__ | 122 | xe-0/0/22.0* |
| __employee_123__ | 123 | xe-0/0/22.0* |
| __employee_124__ | 124 | xe-0/0/22.0* |
| __employee_125__ | 125 | xe-0/0/22.0* |
| __employee_126__ | 126 | xe-0/0/22.0* |
| __employee_127__ | 127 | xe-0/0/22.0* |
| __employee_128__ | 128 | xe-0/0/22.0* |
| __employee_129__ | 129 | xe-0/0/22.0* |
| __employee_130__ | 130 | xe-0/0/22.0* |



## CHAPTER 11

# MAC Address Operational Commands

- `show ethernet-switching mac-learning-log`
- `show ethernet-switching mac-notification`
- `show ethernet-switching statistics aging`
- `show ethernet-switching statistics mac-learning`

## show ethernet-switching mac-learning-log

**Supported Platforms** [EX4600, QFabric System, QFX Series standalone switches](#)

**Syntax** `show ethernet-switching mac-learning-log`

**Release Information** Command introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Displays the event log of learned MAC addresses.

**Required Privilege Level** view

**Related Documentation**

- [show ethernet-switching table on page 216](#)
- [show ethernet-switching interfaces on page 212](#)

**List of Sample Output** [show ethernet-switching mac-learning-log on page 236](#)

**Output Fields** [Table 12 on page 236](#) lists the output fields for the `show ethernet-switching mac-learning-log` command. Output fields are listed in the approximate order in which they appear.

**Table 12: show ethernet-switching mac-learning-log Output Fields**

| Field Name     | Field Description                                                                                                                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date and Time  | Timestamp in UTC when the MAC operation occurred.                                                                                                                                                                                                                                             |
| vlan_name      | VLAN name. A value defined by the user for all user-configured VLANs. The name of the VLAN on which the MAC is learned.                                                                                                                                                                       |
| MAC            | Learned MAC address.                                                                                                                                                                                                                                                                          |
| Event op       | MAC address that are added, learned, deleted, changed or moved from one interface to another interface.                                                                                                                                                                                       |
| Interface Name | The name of the interface on which the MAC address is learned. When a MAC address is moved, there is another field with the name of the interface. The log displays the name of the interface from where the MAC address moved, and the name of the interface to where the MAC address moved. |
| Flags          | Displays the MAC address flags in which the MAC event occurred. This option is for debugging purposes.                                                                                                                                                                                        |

## Sample Output

### show ethernet-switching mac-learning-log

```
user@switch> show ethernet-switching mac-learning-log
Mon Jun 30 13:49:49 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was learned on
ge-1/0/22.0 with flags: 0x2001f << MAC address that as dynamically learned
Mon Jun 30 13:50:29 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was deleted from
ge-1/0/22.0 with flags: 0x1080 << MAC address that was deleted
Mon Jun 30 13:51:28 2014 vlan_name v11+11 mac 00:00:00:01:01:01 was added to
ge-1/0/22.0 with flags: 0x2013f << Static MAC address that was added
Mon Jun 30 13:51:46 2014 vlan_name v11+11 mac 00:00:00:01:01:01 was deleted from
```

```
ge-1/0/22.0 with flags: 0x1120 << delete of Static MAC address that was deleted
Mon Jun 30 13:52:03 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was learned on
ge-1/0/22.0 with flags: 0x2001f << MAC address that was dynamically learned
Mon Jun 30 13:52:11 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was moved from
ge-1/0/22.0 to ge-1/0/21.0 with flags: 0x2101f << MAC address that was moved
Mon Jun 30 13:54:24 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was changed on
ge-1/0/21.0 with flags: 0x2113f << MAC address that changed from a dynamic
address to a static address
```

## show ethernet-switching mac-notification

|                                 |                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Platforms</b>      | EX Series, QFabric System, QFX Series standalone switches                                                                                                                                           |
| <b>Syntax</b>                   | show ethernet-switching mac-notification                                                                                                                                                            |
| <b>Release Information</b>      | Command introduced in Junos OS Release 9.6 for EX Series switches.<br>Command introduced in Junos OS Release 11.1 for the QFX Series.                                                               |
| <b>Description</b>              | Display information about MAC notification.                                                                                                                                                         |
| <b>Required Privilege Level</b> | view                                                                                                                                                                                                |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li><i>Verifying That MAC Notification Is Working Properly</i></li> </ul>                                                                                        |
| <b>List of Sample Output</b>    | <a href="#">show ethernet-switching mac-notification (MAC Notification Enabled) on page 238</a><br><a href="#">show ethernet-switching mac-notification (MAC Notification Disabled) on page 238</a> |
| <b>Output Fields</b>            | Table 13 on page 238 lists the output fields for the <b>show ethernet-switching mac-notification</b> command. Output fields are listed in the order in which they appear.                           |

Table 13: show ethernet-switching mac-notification Output Fields

| Field Name                         | Field Description                                                                                                                                                             |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Notification Status</b>         | MAC notification status: <ul style="list-style-type: none"> <li><b>Enabled</b>—MAC notification is enabled.</li> <li><b>Disabled</b>—MAC notification is disabled.</li> </ul> |
| <b>Notification Interval</b>       | MAC notification interval in seconds.                                                                                                                                         |
| <b>Notifications Sent</b>          | Number of notifications sent to SNMP when MACs are learned or when MACs age out.                                                                                              |
| <b>Notifications Table Maxsize</b> | Maximum size of the notification table, which is populated when notifications are sent to the SNMP server.                                                                    |

### Sample Output

#### show ethernet-switching mac-notification (MAC Notification Enabled)

```

user@switch> show ethernet-switching mac-notification
Notification Status : Enabled
Notification Interval : 30
Notifications Sent : 0
Notifications Table Maxsize : 256

```

### Sample Output

#### show ethernet-switching mac-notification (MAC Notification Disabled)

```

user@switch> show ethernet-switching mac-notification

```



```
Notification Status : Disabled
Notification Interval : 0
Notifications Sent : 0
Notifications Table Maxsize : 256
```

## show ethernet-switching statistics aging

**Supported Platforms** [EX4600, QFabric System, QFX Series standalone switches](#)

**Syntax** `show ethernet-switching statistics aging`  
`<brief | detail>`

**Release Information** Command introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Display media access control (MAC) aging statistics.

**Options** **none**—(Optional) Display MAC aging statistics.

**brief | detail**—(Optional) Display the specified level of output.

**Required Privilege Level** view

**Related Documentation**

- [show ethernet-switching statistics mac-learning on page 242](#)
- [Configuring MAC Table Aging on page 40](#)

**List of Sample Output** [show ethernet-switching statistics aging on page 241](#)

**Output Fields** [Table 14 on page 240](#) lists the output fields for the **show ethernet-switching statistics aging** command. Output fields are listed in the approximate order in which they appear.

**Table 14: show ethernet-switching statistics aging Output Fields**

| Field Name                         | Field Description                                                                                                                                                                                                                                                                                                                                                                   | Level of Output |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Total age messages received</b> | Total number of aging messages received from the hardware.                                                                                                                                                                                                                                                                                                                          | All levels      |
| <b>Immediate aging</b>             | Aging message indicating that the entry should be removed immediately.                                                                                                                                                                                                                                                                                                              | All levels      |
| <b>MAC address seen</b>            | Aging message indicating that the MAC address has been detected by hardware and that the aging timer should be stopped.                                                                                                                                                                                                                                                             | All levels      |
| <b>MAC address not seen</b>        | Aging message indicating that the MAC address has not been detected by the hardware and that the aging timer should be started.                                                                                                                                                                                                                                                     | All levels      |
| <b>Error age messages</b>          | The received aging message contains the following errors: <ul style="list-style-type: none"> <li>• <b>Invalid VLAN</b>—The VLAN of the packet does not exist.</li> <li>• <b>No such entry</b>—The MAC address and VLAN pair provided by the aging message does not exist.</li> <li>• <b>Static entry</b>—An unsuccessful attempt was made to age out a static MAC entry.</li> </ul> | All levels      |

## Sample Output

### show ethernet-switching statistics aging

```
user@switch> show ethernet-switching statistics aging
```

```
Total age messages received: 0
```

```
Immediate aging: 0, MAC address seen: 0, MAC address not seen: 0
```

```
Error age messages: 0
```

```
Invalid VLAN: 0, No such entry: 0, Static entry: 0
```

## show ethernet-switching statistics mac-learning

---

**Supported Platforms** [EX Series, QFabric System, QFX Series standalone switches](#)

**Syntax** `show ethernet-switching statistics mac-learning`  
`<brief | detail>`  
`<interface interface-name>`

**Release Information** Command introduced in Junos OS Release 9.4 for EX Series switches.  
Command introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Display media access control (MAC) learning statistics.

**Options** **none**—(Optional) Display MAC learning statistics for all interfaces.

**brief | detail**—(Optional) Display the specified level of output. The default is **brief**.

**interface *interface-name***—(Optional) Display MAC learning statistics for the specified interface.

**Required Privilege Level** view

**Related Documentation**

- [show ethernet-switching statistics aging](#)
- [show ethernet-switching mac-learning-log](#)
- [show ethernet-switching table](#)
- [show ethernet-switching interfaces](#)
- [Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch](#)
- [Example: Setting Up Bridging with Multiple VLANs for EX Series Switches](#)
- [show ethernet-switching statistics aging on page 240](#)
- [show ethernet-switching mac-learning-log on page 236](#)
- [show ethernet-switching table on page 216](#)
- [show ethernet-switching interfaces on page 212](#)
- [Example: Setting Up Basic Bridging and a VLAN on the QFX Series](#)
- [Example: Setting Up Bridging with Multiple VLANs](#)

**List of Sample Output** [show ethernet-switching statistics mac-learning on page 243](#)  
[show ethernet-switching statistics mac-learning detail on page 244](#)  
[show ethernet-switching statistics mac-learning interface ge-0/0/28 detail on page 244](#)  
[show ethernet-switching statistics mac-learning interface on page 244](#)  
[show ethernet-switching statistics mac-learning detail \(QFX Series\) on page 244](#)

**Output Fields** [Table 15 on page 243](#) lists the output fields for the **show ethernet-switching statistics mac-learning** command. Output fields are listed in the approximate order in which they appear.

Table 15: show ethernet-switching statistics mac-learning Output Fields

| Field Name                                   | Field Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Level of Output |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Interface</b>                             | Name of the interface for which statistics are being reported. (Displayed in the output under the heading <b>Interface</b> .)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | All levels      |
| <b>Learning message from local packets</b>   | MAC learning message generated due to packets coming in on the management interface. (Displayed in the output under the heading <b>Local pkts</b> .)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | All levels      |
| <b>Learning message from transit packets</b> | MAC learning message generated due to packets coming in on network interfaces. (Displayed in the output under the heading <b>Transit pkts</b> .)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | All levels      |
| <b>Learning message with error</b>           | <p>MAC learning messages received with errors (Displayed under the heading <b>Error</b>):</p> <ul style="list-style-type: none"> <li>• <b>Invalid VLAN</b>—The VLAN of the packet does not exist.</li> <li>• <b>Invalid MAC</b>—The MAC address is either NULL or a multicast MAC address.</li> <li>• <b>Security violation</b>—The MAC address is not an allowed MAC address.</li> <li>• <b>Interface down</b>—The MAC address is learned on an interface that is down.</li> <li>• <b>Incorrect membership</b>—The MAC address is learned on an interface that is not a member of the VLAN.</li> <li>• <b>Interface limit</b>—The number of MAC addresses learned on the interface has exceeded the limit.</li> <li>• <b>MAC move limit</b>—This MAC address has moved among multiple interfaces too many times in a given interval.</li> <li>• <b>VLAN limit</b>—The number of MAC addresses learned on the VLAN has exceeded the limit.</li> <li>• <b>VLAN membership limit</b>—The number of MAC addresses learned on the interface as a member of the specified VLAN (VLAN membership MAC limit) has exceeded the limit.</li> <li>• <b>Invalid VLAN index</b>—The VLAN of the packet, although configured, does not yet exist in the kernel.</li> <li>• <b>Interface not learning</b>—The MAC address is learned on an interface that does not yet allow learning—for example, the interface is blocked.</li> <li>• <b>No nexthop</b>—The MAC address is learned on an interface that does not have a unicast next hop.</li> <li>• <b>MAC learning disabled</b>—The MAC address is learned on an interface on which MAC learning has been disabled.</li> <li>• <b>Others</b>—The message contains some other error.</li> </ul> | All levels      |

## Sample Output

### show ethernet-switching statistics mac-learning

```

user@switch> show ethernet-switching statistics mac-learning

Learning stats: 0 learn msg rcvd, 0 error
Interface Local pkts Transit pkts Error
ge-0/0/0.0 0 0 0
ge-0/0/1.0 0 0 0
ge-0/0/2.0 0 0 0
ge-0/0/3.0 0 0 0

```

**show ethernet-switching statistics mac-learning detail**

```
user@switch> show ethernet-switching statistics mac-learning detail
Learning stats: 0 learn msg rcvd, 0 error
```

```
Interface: ge-0/0/0.0
Learning message from local packets: 0
Learning message from transit packets: 1
Learning message with error: 0
 Invalid VLAN: 0 Invalid MAC: 0
 Security violation: 0 Interface down: 0
 Incorrect membership: 0 Interface limit: 0
 MAC move limit: 0 VLAN limit: 0
 Invalid VLAN index: 0 Interface not learning: 0
 No nexthop: 0 MAC learning disabled: 0
 Others: 0
```

```
Interface: ge-0/0/1.0
Learning message from local packets: 0
Learning message from transit packets: 2
Learning message with error: 0
 Invalid VLAN: 0 Invalid MAC: 0
 Security violation: 0 Interface down: 0
 Incorrect membership: 0 Interface limit: 0
 MAC move limit: 0 VLAN limit: 0
 Invalid VLAN index: 0 Interface not learning: 0
 No nexthop: 0 MAC learning disabled: 0
 Others: 0
```

**show ethernet-switching statistics mac-learning interface ge-0/0/28 detail**

```
user@switch> show ethernet-switching statistics mac-learning interface ge-0/0/28 detail
```

```
Interface: ge-0/0/28.0
Learning message from local packets: 0
Learning message from transit packets: 5
Learning message with error: 0
 Invalid VLAN: 0 Invalid MAC: 0
 Security violation: 0 Interface down: 0
 Incorrect membership: 0 Interface limit: 0
 MAC move limit: 0 VLAN limit: 0
 VLAN membership limit: 20
 Invalid VLAN index: 0 Interface not learning: 0
 No nexthop: 0 MAC learning disabled: 0
 Others: 0
```

**show ethernet-switching statistics mac-learning interface**

```
user@switch> show ethernet-switching statistics mac-learning interface ge-0/0/1
```

| Interface  | Local pkts | Transit pkts | Error |
|------------|------------|--------------|-------|
| ge-0/0/1.0 | 0          | 1            | 1     |

**show ethernet-switching statistics mac-learning detail (QFX Series)**

```
user@switch> show ethernet-switching statistics mac-learning detail
Learning stats: 0 learn msg rcvd, 0 error
```

```
Interface: xe-0/0/0.0
Learning message from local packets: 0
Learning message from transit packets: 1
Learning message with error: 0
```

|                       |   |                         |   |
|-----------------------|---|-------------------------|---|
| Invalid VLAN:         | 0 | Invalid MAC:            | 0 |
| Security violation:   | 0 | Interface down:         | 0 |
| Incorrect membership: | 0 | Interface limit:        | 0 |
| MAC move limit:       | 0 | VLAN limit:             | 0 |
| Invalid VLAN index:   | 0 | Interface not learning: | 0 |
| No nexthop:           | 0 | MAC learning disabled:  | 0 |
| Others:               | 0 |                         |   |

Interface: xe-0/0/1.0

Learning message from local packets: 0

Learning message from transit packets: 2

Learning message with error: 0

|                       |   |                         |   |
|-----------------------|---|-------------------------|---|
| Invalid VLAN:         | 0 | Invalid MAC:            | 0 |
| Security violation:   | 0 | Interface down:         | 0 |
| Incorrect membership: | 0 | Interface limit:        | 0 |
| MAC move limit:       | 0 | VLAN limit:             | 0 |
| Invalid VLAN index:   | 0 | Interface not learning: | 0 |
| No nexthop:           | 0 | MAC learning disabled:  | 0 |
| Others:               | 0 |                         |   |





## CHAPTER 12

# Spanning Tree Monitoring Commands

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

## clear error bpdu interface

---

**Supported Platforms** [EX Series, QFX Series](#)

**Syntax** `clear error bpdu interface (all | interface-name)`

**Release Information** Command introduced in Junos OS Release 9.4.  
Command introduced in Junos OS Release 13.2X50-D10 for EX Series switches.  
Command supports **all** option in Junos OS Release 15.1 for EX Series switches.

**Description** Clear a bridge protocol data unit (BPDU) error condition caused by the detection of a possible bridging loop from Spanning Tree Protocol (STP) operation.

**Required Privilege Level** clear

**Related Documentation**

- [Configuring BPDU Protection on Spanning Tree Interfaces on page 72](#)
- [Unblocking an Interface That Receives BPDUs in Error \(CLI Procedure\) on page 73](#)

**List of Sample Output** [clear error bpdu interface on page 248](#)


**Output Fields** When you enter this command, you are provided feedback on the status of your request.

### Sample Output

#### clear error bpdu interface

```
user@switch> clear error bpdu interface ge-1/1/1
```

## clear spanning-tree statistics

|                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms                                                                                                                                                                 | EX Series, M Series, MX Series, QFabric System, QFX Series standalone switches, T Series                                                                                                                                                                                                                                |
| List of Syntax                                                                                                                                                                      | <a href="#">Syntax on page 249</a><br><a href="#">Syntax (EX Series Switches and the QFX Series) on page 249</a>                                                                                                                                                                                                        |
| Syntax                                                                                                                                                                              | clear spanning-tree statistics<br><interface <i>interface-name</i> ><br><logical-system <i>logical-system-name</i> >                                                                                                                                                                                                    |
| Syntax (EX Series Switches and the QFX Series)                                                                                                                                      | clear spanning-tree statistics<br><interface <i>interface-name</i> >                                                                                                                                                                                                                                                    |
| Release Information                                                                                                                                                                 | 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.                                                                                                                                    |
| Description                                                                                                                                                                         | Clear Spanning Tree Protocol statistics.                                                                                                                                                                                                                                                                                |
| Options                                                                                                                                                                             | <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>  <p>NOTE: The <b>logical-system</b> option is not available on QFabric systems.</p> </div> |                                                                                                                                                                                                                                                                                                                         |
| Required Privilege Level                                                                                                                                                            | clear                                                                                                                                                                                                                                                                                                                   |
| Related Documentation                                                                                                                                                               | <ul style="list-style-type: none"> <li><a href="#">show spanning-tree statistics on page 263</a></li> </ul>                                                                                                                                                                                                             |
| List of Sample Output                                                                                                                                                               | <a href="#">clear stp statistics on page 249</a>                                                                                                                                                                                                                                                                        |

### Sample Output

#### clear stp statistics

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

## show spanning-tree bridge

**Supported Platforms** [M Series](#), [MX Series](#), [QFX Series](#), [T Series](#)

**List of Syntax** [Syntax on page 250](#)  
[Syntax \(QFX Series\) on page 250](#)

**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 251](#)  
[show spanning-tree bridge msti on page 252](#)  
[show spanning-tree bridge vlan-id \(MSTP\) on page 253](#)  
[show spanning-tree bridge \(RSTP\) on page 253](#)  
[show spanning-tree bridge vlan-id \(RSTP\) on page 254](#)

**Output Fields** [Table 16 on page 250](#) 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. |

Table 16: show spanning-tree bridge Output Fields (*continued*)

| Field Name                      | Field Description                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Enabled protocol                | Spanning Tree Protocol type enabled.                                                                                                            |
| Root ID                         | Bridge ID of the elected spanning-tree root bridge. The bridge ID consists of a configurable bridge priority and the MAC address of the bridge. |
| 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>Supported Platforms</b>                            | EX Series, M Series, MX Series, QFX Series, T Series                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>List of Syntax</b>                                 | <a href="#">Syntax on page 255</a><br><a href="#">Syntax (EX Series Switches and the QFX Series) on page 255</a>                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Syntax</b>                                         | show spanning-tree interface<br><brief   detail><br><msti <i>msti-id</i> ><br><routing-instance <i>routing-instance-name</i> ><br><vlan-id <i>vlan-id</i> >                                                                                                                                                                                                                                                                                                                                                      |
| <b>Syntax (EX Series Switches and the QFX Series)</b> | show spanning-tree interface<br><brief   detail><br><msti <i>msti-id</i> ><br><vlan-id <i>vlan-id</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>                                    | 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 MST instance.</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 256</a><br><a href="#">show spanning-tree interface (QFX Series) on page 257</a><br><a href="#">show spanning-tree interface detail on page 257</a><br><a href="#">show spanning-tree interface msti on page 259</a><br><a href="#">show spanning-tree interface vlan-id on page 259</a><br><a href="#">show spanning-tree interface (VSTP) on page 260</a><br><a href="#">show spanning-tree interface vlan-id (VSTP) on page 260</a>                          |
| <b>Output Fields</b>                                  | <a href="#">Table 17 on page 256</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                                                                                                                                                     |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Interface name</b>       | Interface configured to participate in the STP, RSTP, VSTP, or MSTP instance.                                                                                         |
| <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

|                                              |                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platforms                          | EX Series, M Series, MX Series, QFX Series, T Series                                                                                                                                                                                                                                    |
| List of Syntax                               | <a href="#">Syntax on page 261</a><br><a href="#">Syntax (EX Series Switch and the QFX Series) on page 261</a>                                                                                                                                                                          |
| Syntax                                       | show spanning-tree mstp configuration<br><brief   detail><br><routing-instance <i>routing-instance-name</i> >                                                                                                                                                                           |
| Syntax (EX Series Switch and the QFX Series) | show spanning-tree mstp configuration<br><brief   detail>                                                                                                                                                                                                                               |
| Release Information                          | 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.                                                                                                    |
| Description                                  | Display the MSTP configuration.                                                                                                                                                                                                                                                         |
| Options                                      | <b>none</b> —Display MSTP configuration information.<br><br><b>brief   detail</b> —(Optional) Display the specified level of output.<br><br><b>routing-instance <i>routing-instance-name</i></b> —(Optional) Display MSTP configuration information for the specified routing instance. |
| Required Privilege Level                     | view                                                                                                                                                                                                                                                                                    |
| List of Sample Output                        | <a href="#">show spanning-tree mstp configuration detail on page 262</a><br><a href="#">show spanning-tree mstp configuration detail (QFX Series) on page 262</a>                                                                                                                       |
| Output Fields                                | <a href="#">Table 18 on page 261</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 18: show spanning-tree mstp configuration Output Fields**

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

## Sample Output

### show spanning-tree mstp configuration detail

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

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

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

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

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



## show spanning-tree statistics

**Supported Platforms** [EX Series](#), [M Series](#), [MX Series](#), [QFX Series](#), [T Series](#)

**List of Syntax** [Syntax on page 263](#)  
[Syntax \(EX Series Switch and the QFX Series\) on page 263](#)

**Syntax** show spanning-tree statistics  
 <brief | detail>  
 <interface *interface-name*>  
 <routing-instance *routing-instance-name*>

**Syntax (EX Series Switch and the QFX Series)** show spanning-tree statistics  
 <brief | detail>  
 <interface *interface-name* | vlan *vlan-id*>

**Release Information** Command introduced in Junos OS Release 8.4.  
 Command introduced in Junos OS Release 9.0 for EX Series switches.  
 Command introduced in Junos OS Release 11.1 for QFX Series switches.

**Description** Display STP statistics.

**Options** **none**—Display brief STP statistics.

**brief | detail**—(Optional) Display the specified level of output.

**interface *interface-name***—(Optional) Display STP statistics for the specified interface.

**routing-instance *routing-instance-name***—(Optional) Display STP statistics for the specified routing instance.

**Required Privilege Level** view

**List of Sample Output** [show spanning-tree statistics routing-instance on page 264](#)  
[show spanning-tree statistics interface routing-instance detail on page 264](#)

**Output Fields** [Table 19 on page 263](#) lists the output fields for the **show spanning-tree statistics** command. Output fields are listed in the approximate order in which they appear.

**Table 19: 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. |

Table 19: show spanning-tree statistics Output Fields (*continued*)

| Field Name                      | Field Description                                              |
|---------------------------------|----------------------------------------------------------------|
| BPDUs received in last interval | Number of BPDUs received within a specified interval.          |
| Interface                       | Interface for which the statistics are being displayed.        |
| Next BPDU transmission          | Number of seconds until the next BPDU is scheduled to be sent. |

## Sample Output

### show spanning-tree statistics routing-instance

```
user@host> show spanning-tree statistics routing-instance vs1 detail
Routing instance level STP statistics
Message type : bpdus
BPDUs sent : 1396
BPDUs received : 1027
BPDUs sent in last interval : 5 (duration: 4 sec)
BPDUs received in last interval: 4 (duration: 4 sec)
```

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

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