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Junos<sup>®</sup> OS

## OVSDB and VXLAN Feature Guide for QFX Series Switches (Contrail)



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## Documentation and Release Notes

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

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

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## Using the Examples in This Manual

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

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

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

## Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

## Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

```
[edit]
```

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

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

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

For more information about the **load** command, see [CLI Explorer](#).

## Documentation Conventions

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

Table 1: Notice Icons







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

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

Table 2: Text and Syntax Conventions

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

Table 2: Text and Syntax Conventions (continued)

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

Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the [Juniper Networks TechLibrary](#) site, and do one of the following:



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- Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.
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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <https://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: <https://www.juniper.net/customers/support/>
- Search for known bugs: <https://prsearch.juniper.net/>
- Find product documentation: <https://www.juniper.net/documentation/>
- Find solutions and answer questions using our Knowledge Base: <https://kb.juniper.net/>
- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <https://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <https://www.juniper.net/cm/>

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

## 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 <https://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 <https://www.juniper.net/support/requesting-support.html>.



## PART 1

# Overview

- [OVSDB and VXLAN Overview on page 3](#)



## CHAPTER 1

# OVSDB and VXLAN Overview

- [Understanding VXLANs on page 3](#)
- [VXLAN Constraints on QFX Series and EX4600 Switches on page 10](#)
- [OVSDB Support on Juniper Networks Devices on page 13](#)
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## Understanding VXLANs

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Virtual Extensible LAN protocol (VXLAN) technology allows networks to support more VLANs. According to the IEEE 802.1Q standard, traditional VLAN identifiers are 12 bits long—this naming limits networks to 4094 VLANs. The VXLAN protocol overcomes this limitation by using a longer logical network identifier that allows more VLANs and, therefore, more logical network isolation for large networks such as clouds that typically include many virtual machines.

- [VXLAN Benefits on page 4](#)
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- [Using an MX Series Router, EX9200 Switch, or QFX10000 Switch as a VTEP on page 7](#)
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- [Load Balancing VXLAN Traffic on page 9](#)
- [VLAN IDs for VXLANs on page 9](#)

## VXLAN Benefits

VXLAN technology allows you to segment your networks (as VLANs do), but it provides benefits that VLANs cannot. Here are the most important benefits of using VXLANs:

- You can theoretically create as many as 16 million VXLANs in an administrative domain (as opposed to 4094 VLANs on a Juniper Networks device).
  - MX Series routers and EX9200 switches support as many as 32,000 VXLANs, 32,000 multicast groups, and 8000 virtual tunnel endpoints (VTEPs). This means that VXLANs based on MX Series routers provide network segmentation at the scale required by cloud builders to support very large numbers of tenants.
  - QFX10000 Series switches support 4000 VXLANs and 2000 remote VTEPs.
  - QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 switches support 4000 VXLANs, 4000 multicast groups, and 2000 remote VTEPs.
- You can enable migration of virtual machines between servers that exist in separate Layer 2 domains by tunneling the traffic over Layer 3 networks. This functionality allows you to dynamically allocate resources within or between data centers without being constrained by Layer 2 boundaries or being forced to create large or geographically stretched Layer 2 domains.

Using VXLANs to create smaller Layer 2 domains that are connected over a Layer 3 network means that you do not need to use Spanning Tree Protocol (STP) to converge the topology but can use more robust routing protocols in the Layer 3 network instead. In the absence of STP, none of your links are blocked, which means you can get full value from all the ports that you purchase. Using routing protocols to connect your Layer 2 domains also allows you to load-balance the traffic to ensure that you get the best use of your available bandwidth. Given the amount of east-west traffic that often flows within or between data centers, maximizing your network performance for that traffic is very important.

The video *Why Use an Overlay Network in a Data Center?* presents a brief overview of the advantages of using VXLANs.



Video: [Why Use an Overlay Network in a Data Center?](#)

---

## How Does VXLAN Work?

VXLAN is often described as an overlay technology because it allows you to stretch Layer 2 connections over an intervening Layer 3 network by encapsulating (tunneling) Ethernet frames in a VXLAN packet that includes IP addresses. Devices that support VXLANs are called *virtual tunnel endpoints (VTEPs)*—they can be end hosts or network switches or routers. VTEPs encapsulate VXLAN traffic and de-encapsulate that traffic when it leaves the VXLAN tunnel. To encapsulate an Ethernet frame, VTEPs add a number of fields, including the following fields:

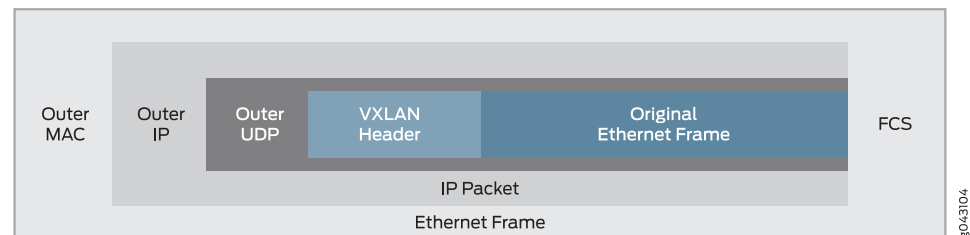
- Outer media access control (MAC) destination address (MAC address of the tunnel endpoint VTEP)
- Outer MAC source address (MAC address of the tunnel source VTEP)
- Outer IP destination address (IP address of the tunnel endpoint VTEP)
- Outer IP source address (IP address of the tunnel source VTEP)
- Outer UDP header
- A VXLAN header that includes a 24-bit field—called the *VXLAN network identifier (VNI)*—that is used to uniquely identify the VXLAN. The VNI is similar to a VLAN ID, but having 24 bits allows you to create many more VXLANs than VLANs.



**NOTE:** Because VXLAN adds 50 to 54 bytes of additional header information to the original Ethernet frame, you might want to increase the MTU of the underlying network. In this case, configure the MTU of the physical interfaces that participate in the VXLAN network, not the MTU of the logical VTEP source interface, which is ignored.

Figure 1 on page 5 shows the VXLAN packet format.

Figure 1: VXLAN Packet Format



## VXLAN Implementation Methods

Junos OS supports implementing VXLANs in the following environments:

- Manual VXLAN—In this environment, a Juniper Networks device acts as a transit device for downstream devices acting as VTEPs, or a gateway that provides connectivity for downstream servers that host virtual machines (VMs), which communicate over a Layer 3 network. In this environment, software-defined networking (SDN) controllers are not deployed.



**NOTE:** QFX10000 switches do not support manual VXLANs.

- OVSDb-VXLAN—In this environment, SDN controllers use the Open vSwitch Database (OVSDb) management protocol to provide a means through which controllers (such as a VMware NSX or Juniper Networks Contrail controller) and Juniper Networks devices that support OVSDb can communicate.

- **EVPN-VXLAN**—In this environment, Ethernet VPN (EVPN) is a control plane technology that enables hosts (physical servers and VMs) to be placed anywhere in a network and remain connected to the same logical Layer 2 overlay network, and VXLAN creates the data plane for the Layer 2 overlay network.

## Using QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 Switches with VXLANs

You can configure the switches to perform all of the following roles:

- In an environment without an SDN controller, act as a transit Layer 3 switch for downstream hosts acting as VTEPs. In this configuration, you do not need to configure any VXLAN functionality on the switch. You do need to configure IGMP and PIM so that the switch can form the multicast trees for the VXLAN multicast groups. (See [Manual VXLANs Require PIM on page 8](#) for more information.)
- In an environment with or without an SDN controller, act as a Layer 2 gateway between virtualized and nonvirtualized networks in the same data center or between data centers. For example, you can use the switch to connect a network that uses VXLANs to one that uses VLANs.
- Act as a Layer 2 gateway between virtualized networks in the same or different data centers and allow virtual machines to move (VMotion) between those networks and data centers. For example, if you want to allow VMotion between devices in two different networks, you can create the same VLAN in both networks and put both devices on that VLAN. The switches connected to these devices, acting as VTEPs, can map that VLAN to the same VXLAN, and the VXLAN traffic can then be routed between the two networks.
- (QFX5110 switches with EVPN-VXLAN) Act as a Layer 3 gateway to route traffic between different VXLANs in the same data center.
- (QFX5110 switches with EVPN-VXLAN) Act as a Layer 3 gateway to route traffic between different VXLANs in different data centers over a WAN or the Internet using standard routing protocols or virtual private LAN service (VPLS) tunnels.



**NOTE:** If you want a QFX5110 switch to be a Layer 3 VXLAN gateway in an EVPN-VXLAN environment, you must configure integrated routing and bridging (IRB) interfaces to connect the VXLANs, just as you do if you want to route traffic between VLANs.

Because the additional headers add 50 to 54 bytes, you might need to increase the MTU on a VTEP to accommodate larger packets. For example, if the switch is using the default MTU value of 1514 bytes and you want to forward 1500-byte packets over the VXLAN, you need to increase the MTU to allow for the increased packet size caused by the additional headers.

## Changing the UDP Port on QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 Switches

Starting with Junos OS Release 14.1X53-D25 on QFX5100 switches, Junos OS Release 15.1X53-D210 on QFX5110 and QFX5200 switches, Junos OS Release 18.1R1 on QFX5210

switches, and Junos OS Release 18.2R1 on EX4600 switches, you can configure the UDP port used as the destination port for VXLAN traffic. To configure the VXLAN destination port to be something other than the default UDP port of 4789, enter the following statement:

```
set protocols l2-learning destination-udp-port port-number
```

The port you configure will be used for all VXLANs configured on the switch.



**NOTE:** If you make this change on one switch in a VXLAN, you must make the same change on all the devices that terminate the VXLANs configured on your switch. If you do not do so, traffic will be disrupted for all the VXLANs configured on your switch. When you change the UDP port, the previously learned remote VTEPs and remote MACs are lost and VXLAN traffic is disrupted until the switch relearns the remote VTEPs and remote MACs.

## Controlling Transit Multicast Traffic on QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 Switches

When the switch acting as a VTEP receives a broadcast, unknown unicast, or multicast packet, it performs the following actions on the packet:

1. It de-encapsulates the packet and delivers it to the locally attached hosts.
2. It then adds the VXLAN encapsulation again and sends the packet to the other VTEPs in the VXLAN.

These actions are performed by the loopback interface used as the VXLAN tunnel address and can, therefore, negatively impact the bandwidth available to the VTEP. Starting with Junos OS Release 14.1X53-D30 for QFX5100 switches, Junos OS Release 15.1X53-D210 for QFX5110 and QFX5200 switches, Junos OS Release 18.1R1 for QFX5210 switches, and Junos OS Release 18.2R1 for EX4600 switches, if you know that there are no multicast receivers attached to other VTEPs in the VXLAN that want traffic for a specific multicast group, you can reduce the processing load on the loopback interface by entering the following statement:

```
set protocols l2-learning disable-vxlan-multicast-transit vxlan-multicast-group multicast-group
```

In this case, no traffic will be forwarded for the specified group but all other multicast traffic will be forwarded. If you do not want to forward any multicast traffic to other VTEPs in the VXLAN, enter the following statement:

```
set protocols l2-learning disable-vxlan-multicast-transit vxlan-multicast-group all
```

## Using an MX Series Router, EX9200 Switch, or QFX10000 Switch as a VTEP

You can configure an MX Series router, EX9200 switch, or QFX10000 switch to act as a VTEP and perform all of the following roles:

- Act as a Layer 2 gateway between virtualized and nonvirtualized networks in the same data center or between data centers. For example, you can use an MX Series router to connect a network that uses VXLANs to one that uses VLANs.
- Act as a Layer 2 gateway between virtualized networks in the same or different data centers and allow virtual machines to move (VMotion) between those networks and data centers.
- Act as a Layer 3 gateway to route traffic between different VXLANs in the same data center.
- Act as a Layer 3 gateway to route traffic between different VXLANs in different data centers over a WAN or the Internet using standard routing protocols or virtual private LAN service (VPLS) tunnels.



**NOTE:** If you want one of the devices described in this section to be a VXLAN Layer 3 gateway, you must configure integrated routing and bridging (IRB) interfaces to connect the VXLANs, just as you do if you want to route traffic between VLANs.

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## Manual VXLANs Require PIM

In an environment with a controller (such as a VMware NSX or Juniper Networks Contrail controller), you can provision VXLANs on a Juniper Networks device. A controller also provides a control plane that VTEPs use to advertise their reachability and learn about the reachability of other VTEPs. You can also manually create VXLANs on Juniper Networks devices instead of using a controller. If you use this approach, you must also configure Protocol Independent Multicast (PIM) on the VTEPs so that they can create VXLAN tunnels between themselves.

You must also configure each VTEP in a given VXLAN to be a member of the same multicast group. (If possible, you should assign a different multicast group address to each VXLAN, although this is not required. Multiple VXLANs can share the same multicast group.) The VTEPs can then forward ARP requests they receive from their connected hosts to the multicast group. The other VTEPs in the group de-encapsulate the VXLAN information, and (assuming they are members of the same VXLAN) they forward the ARP request to their connected hosts. When the target host receives the ARP request, it responds with its MAC address, and its VTEP forwards this ARP reply back to the source VTEP. Through this process, the VTEPs learn the IP addresses of the other VTEPs in the VXLAN and the MAC addresses of the hosts connected to the other VTEPs.

The multicast groups and trees are also used to forward broadcast, unknown unicast, and multicast (BUM) traffic between VTEPs. This prevents BUM traffic from being unnecessarily flooded outside the VXLAN.





**NOTE:** Multicast traffic that is forwarded through a VXLAN tunnel is sent only to the remote VTEPs in the VXLAN. That is, the encapsulating VTEP does not copy and send copies of the packets according to the multicast tree—it only forwards the received multicast packets to the remote VTEPs. The remote VTEPs de-encapsulate the encapsulated multicast packets and forward them to the appropriate Layer 2 interfaces. Junos OS Release 18.1R1 for QFX5210 switches

## Load Balancing VXLAN Traffic

On QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 switches, the Layer 3 routes that form VXLAN tunnels use per-packet load balancing by default, which means that load balancing is implemented if there are ECMP paths to the remote VTEP. This is different from normal routing behavior in which per-packet load balancing is not used by default. (Normal routing uses per-prefix load balancing by default.)

The source port field in the UDP header is used to enable ECMP load balancing of the VXLAN traffic in the Layer 3 network. This field is set to a hash of the inner packet fields, which results in a variable that ECMP can use to distinguish between tunnels (flows). (None of the other fields that flow-based ECMP normally uses are suitable for use with VXLANs. All tunnels between the same two VTEPs have the same outer source and destination IP addresses, and the UDP destination port is set to port 4789 by definition. Therefore, none of these fields provide a sufficient way for ECMP to differentiate flows.)

## VLAN IDs for VXLANs

When configuring a VLAN ID for a VXLAN on any Juniper Networks device that supports VXLANs except QFX10000 switches, we strongly recommend using a VLAN ID of 3 or higher. If you use a VLAN ID of 1 or 2, replicated broadcast, multicast, and unknown unicast (BUM) packets for these VXLANs might be untagged, which in turn might result in the packets being dropped by a device that receives the packets.

Release History Table

Release	Description
14.1X53-D30	Starting with Junos OS Release 14.1X53-D30 for QFX5100 switches, Junos OS Release 15.1X53-D210 for QFX5110 and QFX5200 switches, Junos OS Release 18.1R1 for QFX5210 switches, and Junos OS Release 18.2R1 for EX4600 switches, if you know that there are no multicast receivers attached to other VTEPs in the VXLAN that want traffic for a specific multicast group, you can reduce the processing load on the loopback interface
14.1X53-D25	Starting with Junos OS Release 14.1X53-D25 on QFX5100 switches, Junos OS Release 15.1X53-D210 on QFX5110 and QFX5200 switches, Junos OS Release 18.1R1 on QFX5210 switches, and Junos OS Release 18.2R1 on EX4600 switches, you can configure the UDP port used as the destination port for VXLAN traffic.

- Related Documentation**
- *Examples: Manually Configuring VXLANs on QFX Series and EX4600 Switches*
  - *Understanding EVPN with VXLAN Data Plane Encapsulation*

- [OVSDB Support on Juniper Networks Devices on page 13](#)
- *mtu*

## **VXLAN Constraints on QFX Series and EX4600 Switches**

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When configuring Virtual Extensible LANs (VXLANs) on QFX Series and EX4600 switches, be aware of the constraints described in the following sections. In these sections, “Layer 3 side” refers to a network-facing interface that performs VXLAN encapsulation and de-encapsulation, and “Layer 2 side” refers to a server-facing interface that is a member of a VLAN that is mapped to a VXLAN.

- [VXLAN Constraints on QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 Switches on page 10](#)
- [VXLAN Constraints on QFX10000 Switches on page 12](#)

### **VXLAN Constraints on QFX5100, QFX5110, QFX5200, QFX5210, and EX4600 Switches**

- (QFX5100 switches only) You can use VXLANs on a Virtual Chassis or Virtual Chassis Fabric (VCF) if all of the members are supported QFX5100 switches. You cannot use VXLANs if any of the members is not a supported QFX5100 switch.
- (EX4600 switches only) You can use VXLANs on a Virtual Chassis if all of the members are supported EX4600 switches. You cannot use VXLANs if any of the members is not a supported EX4600 switch.
- Routing instance constraints:
  - (QFX5100, QFX5200, QFX5210, and EX4600 switches) VXLAN configuration is supported only in the default routing instance.
  - (QFX5110 switches) VXLAN configuration is supported only in a single virtual switching instance and multiple VPN routing and forwarding (VRF) instances.
- (QFX5100, QFX5200, QFX5210, and EX4600 switches) Routing traffic between different VXLANs is not supported.
- (QFX5110 switches only) Routing traffic between a VXLAN and a VLAN is not supported.
- (QFX5110 switches only) Integrated routing and bridging (IRB) interfaces used in EVPN-VXLAN overlay networks do not support routing protocols such as OSPF, IS-IS, and BGP.
- A physical interface cannot be a member of a VLAN and a VXLAN. That is, an interface that performs VXLAN encapsulation and de-encapsulation cannot also be a member of a VLAN. For example, if a VLAN that is mapped to a VXLAN is a member of trunk port xe-0/0/0, any other VLAN that is a member of xe-0/0/0 must also be assigned to a VXLAN.
- Multichassis link aggregation groups (MC-LAGs) are not supported with VXLAN.



**NOTE:** In an EVPN-VXLAN environment, EVPN multihoming active-active mode is used instead of MC-LAG for redundant connectivity between hosts and leaf devices.

- IP fragmentation and defragmentation are not supported on the Layer 3 side.
- The following features are not supported on the Layer 2 side:
  - (QFX5100, QFX5200, QFX5210, and EX4600 switches) IGMP snooping with EVPN-VXLAN.
  - Redundant trunk groups (RTGs).
  - The ability to shut down a Layer 2 interface or temporarily disable the interface when a storm control level is exceeded is not supported.
  - STP (any variant).
- Access port security features are not supported with VXLAN. For example, the following features are not supported:
  - DHCP snooping.
  - Dynamic ARP inspection.
  - MAC limiting and MAC move limiting.



**NOTE:** An exception to this constraint is that MAC limiting is supported on OVSDb-managed interfaces in an OVSDb-VXLAN environment with Contrail controllers. For more information, see [“Features Supported on OVSDb-Managed Interfaces” on page 13](#).

- Ingress node replication is not supported in the following cases:
  - When PIM is used for the control plane (manual VXLAN).
  - When an SDN controller is used for the control plane (OVSDb-VXLAN).

Ingress node replication is supported with EVPN-VXLAN.
- PIM-BIDIR and PIM-SSM are not supported with VXLANs.
- If you configure a port-mirroring instance to mirror traffic exiting from an interface that performs VXLAN encapsulation, the source and destination MAC addresses of the mirrored packets are invalid. The original VXLAN traffic is not affected.
- When configuring a VLAN ID for a VXLAN, we strongly recommend using a VLAN ID of 3 or higher. If you use a VLAN ID of 1 or 2, replicated broadcast, multicast, and unknown unicast (BUM) packets for these VXLANs might be untagged, which in turn might result in the packets being dropped by a device that receives the packets.
- (QFX5110 switches only) VLAN firewall filters are not supported on IRB interfaces on which EVPN-VXLAN is enabled.

- (QFX5100, QFX5100 Virtual Chassis, and QFX5110 switches) Firewall filters and policers are not supported on transit traffic on which EVPN-VXLAN is enabled. They are supported only in the ingress direction on CE-facing interfaces.
- (QFX5100, QFX5100 Virtual Chassis, and QFX5110 switches) For IRB interfaces in an EVPN-VXLAN one-layer IP fabric, firewall filtering and policing is supported only at the ingress point of non-encapsulated frames routed through the IRB interface.

## VXLAN Constraints on QFX10000 Switches

- MC-LAGs are not supported with VXLAN.



**NOTE:** In an EVPN-VXLAN environment, EVPN multihoming active-active mode is used instead of MC-LAG for redundant connectivity between hosts and leaf devices.

- IP fragmentation is not supported on the Layer 3 side.
- The following features are not supported on the Layer 2 side:
  - IGMP snooping with EVPN-VXLAN in Junos OS Releases before Junos OS Release 17.2R1.
  - STP (any variant).
- Access port security features are not supported with VXLAN. For example, the following features are not supported:
  - DHCP snooping.
  - Dynamic ARP inspection.
  - MAC limiting and MAC move limiting.
- Ingress node replication is not supported when an SDN controller is used for the control plane (OVSDB-VXLAN). Ingress node replication is supported for EVPN-VXLAN.
- QFX10000 switches that are deployed in an EVPN-VXLAN environment do not support an IPv6 physical underlay network.
- When the next-hop database on a QFX10000 switch includes next hops for both the underlay network and the EVPN-VXLAN overlay network, the next hop to a VXLAN peer cannot be an Ethernet segment identifier (ESI) or a virtual tunnel endpoint (VTEP) interface.
- IRB interfaces used in EVPN-VXLAN overlay networks do not support routing protocols such as OSPF, IS-IS, and BGP.
- VLAN firewall filters applied to IRB interfaces on which EVPN-VXLAN is enabled.
- Filter-based forwarding (FBF) is not supported on IRB interfaces used in an EVPN-VXLAN environment.

- Related Documentation**
- [Understanding VXLANs on page 3](#)
  - *Examples: Manually Configuring VXLANs on QFX Series and EX4600 Switches*
  - *Manually Configuring VXLANs on QFX Series and EX4600 Switches*

## OVSDb Support on Juniper Networks Devices

The following Juniper Networks devices support the Open vSwitch Database (OVSDb) management protocol:

- EX9200 Line of Ethernet Switches
- MX80, MX104, MX240, MX480, MX960, MX2010, and MX2020 Universal Routing Platforms
- QFX Series Switches

Starting with Junos OS Release 14.1X53-D30 for QFX5100 switches, 15.1X53-D20 for QFX10002 switches, 15.1X53-D30 for QFX10008 switches, 15.1X53-D60 for QFX10016 switches, 15.1X53-D210 for QFX5110 and QFX5200 switches, 16.1R1 for EX9200 switches and MX routers, and 18.1R1 for QFX5210 switches, the OVSDb software (jsdn) package is included in the Junos OS software (jinstall) package. As a result, if you have one of the listed releases or a later release, you no longer need to install the separate jsdn package on the Juniper Networks devices.

**Release History Table**

Release	Description
14.1X53-D30	Starting with Junos OS Release 14.1X53-D30 for QFX5100 switches, 15.1X53-D20 for QFX10002 switches, 15.1X53-D30 for QFX10008 switches, 15.1X53-D60 for QFX10016 switches, 15.1X53-D210 for QFX5110 and QFX5200 switches, 16.1R1 for EX9200 switches and MX routers, and 18.1R1 for QFX5210 switches, the OVSDb software (jsdn) package is included in the Junos OS software (jinstall) package. As a result, if you have one of the listed releases or a later release, you no longer need to install the separate jsdn package on the Juniper Networks devices.

## Features Supported on OVSDb-Managed Interfaces

[Table 3 on page 13](#) lists features supported on Open vSwitch Database (OVSDb)-managed interfaces of QFX5100 switches, the release in which support is introduced, the environment in which the feature is supported, and where to find information about the feature.

**Table 3: Features Supported on OVSDb-Managed Interfaces**

Feature	Junos OS Release in Which Feature Is Initially Introduced	Supported Environment	Where to Find Information
Classifiers	14.1X53-D30	Contrail	<i>Understanding CoS on OVSDb-Managed VXLAN Interfaces</i>

Table 3: Features Supported on OVSDB-Managed Interfaces (continued)

Feature	Junos OS Release in Which Feature Is Initially Introduced	Supported Environment	Where to Find Information
DSCP rewrite rules	14.1X53-D30	Contrail	<i>Understanding CoS on OVSDB-Managed VXLAN Interfaces</i>
Firewall filters	14.1X53-D30	Contrail	<i>Example: Applying a Firewall Filter to OVSDB-Managed Interfaces</i>
MAC limiting  <b>NOTE:</b> MAC move limiting is not supported on OVSDB-managed interfaces.	14.1X53-D30	Contrail	<i>Understanding MAC Limiting and MAC Move Limiting for Port Security</i>
Schedulers	14.1X53-D30	Contrail	<i>Understanding CoS on OVSDB-Managed VXLAN Interfaces</i>
Storm control	14.1X53-D26	Contrail	<i>Understanding Storm Control</i>
Two-rate three-color markers	14.1X53-D30	Contrail	<i>Example: Applying a Policer to OVSDB-Managed Interfaces</i>

## Understanding the OVSDB Protocol Running on Juniper Networks Devices

The Juniper Networks Junos OS implementation of the Open vSwitch Database (OVSDB) management protocol provides a means through which Juniper Networks devices that support OVSDB can communicate with software-defined networking (SDN) controllers. Juniper Networks devices exchange control and statistical information with the SDN controllers, thereby enabling virtual machine (VM) traffic from the entities in a virtualized network to be forwarded to entities in a physical network and vice versa.

The Junos OS implementation of OVSDB includes an OVSDB server and an OVSDB client, both of which run on each Juniper Networks device that supports OVSDB.

The OVSDB server on a Juniper Networks device can communicate with an OVSDB client on an SDN controller. To establish a connection between a Juniper Networks device and an SDN controller, you must specify information about the SDN controller (IP address) and the connection (port over which the connection occurs and the communication protocol to be used) on each Juniper Networks device. After the configuration is successfully committed, the connection is established between the management port of the Juniper Networks device and the SDN controller port that you specify in the Junos OS configuration.

The OVSDB server stores and maintains an OVSDB database schema, which is defined for physical devices. This schema contains control and statistical information provided by the OVSDB client on the Juniper Networks devices and on SDN controllers. This information is stored in various tables in the schema. The OVSDB client monitors the schema for additions, deletions, and modifications to this information, and the information

is used for various purposes, such as learning the media access control (MAC) addresses of virtual hosts and physical servers.

The schema provides a means through which the Juniper Networks devices and the SDN controllers can exchange information. For example, the Juniper Networks devices capture MAC routes to entities in the physical network and push this information to a table in the schema so that SDN controllers with connections to these Juniper Networks devices can access the MAC routes. Conversely, SDN controllers capture MAC routes to entities in the virtualized network and push this information to a table in the schema so that Juniper Networks devices with connections to the SDN controllers can access the MAC routes.

Some of the OVSDb table names include the words *local* or *remote*, for example, *unicast MACs local table* and *unicast MACs remote table*. Information in *local* tables is learned by a Juniper Networks device that functions as a hardware virtual tunnel endpoint (VTEP), while information in *remote* tables is learned from other software or hardware VTEPs.

## Understanding How to Set Up OVSDb Connections on a Juniper Networks Device

The Juniper Networks Junos OS implementation of the Open vSwitch Database (OVSDb) management protocol provides a means through which Juniper Networks devices that support OVSDb can communicate with software-defined networking (SDN) controllers. A Juniper Networks device exchanges control and statistical data with each SDN controller to which it is connected.

You can connect a Juniper Networks device to more than one SDN controller for redundancy.

In a VMware NSX environment, one cluster of NSX controllers typically includes three or five controllers. To implement the OVSDb management protocol on a Juniper Networks device, you must explicitly configure a connection to one SDN controller, using the Junos OS CLI. If the SDN controller to which you explicitly configure a connection is in a cluster, the controller pushes information about other controllers in the same cluster to the device, and the device establishes connections with the other controllers. However, you can also explicitly configure connections with the other controllers in the cluster, using the Junos OS CLI.

To implement the OVSDb management protocol on a Juniper Networks device in a Contrail environment, you must configure a connection to a Contrail controller, using the Junos OS CLI.

Connections to all SDN controllers are made on the management interface of the Juniper Networks device. To set up a connection between a Juniper Networks device and an SDN controller, you need to configure the following parameters on the Juniper Networks device:

- IP address of the SDN controller.
- The protocol that secures the connection. Secure Sockets Layer (SSL) is the supported protocol.



NOTE: The SSL connection requires a private key and certificates, which must be stored in the `/var/db/certs` directory of the Juniper Networks device. See [“Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers”](#) on page 32.

- Number of the port over which the connection is made. The port number of the default port is 6632.

Optionally, you can configure the following connection timers on the Juniper Networks device:

- Inactivity probe duration—The maximum amount of time, in milliseconds, that the connection can be inactive before an inactivity probe is sent. The default value is 0 milliseconds, which means that an inactivity probe is never sent.
- Maximum backoff duration—If an attempt to connect to an SDN controller fails, the maximum amount of time, in milliseconds, before the device can make the next attempt. The default value is 1000 milliseconds.

**Related  
Documentation**

- *Setting Up the OVSDB Protocol on Juniper Networks Devices that Support Manual Configuration of VXLANs*
- [Setting Up OVSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs](#) on page 34



## Understanding How Layer 2 BUM and Layer 3 Routed Multicast Traffic Are Handled with OVSDB

The Juniper Networks Junos OS implementation of the Open vSwitch Database (OVSDB) management protocol provides a means through which software-defined networking (SDN) controllers and Juniper Networks devices that support OVSDB can communicate.

This topic explains how a Juniper Networks device with Virtual Extensible LAN (VXLAN) and OVSDB management protocol capabilities handles the following types of traffic:

- (This scenario applies to all Juniper Networks devices that support VXLAN and OVSDB.) Layer 2 broadcast, unknown unicast, and multicast (BUM) traffic that originates in an OVSDB-managed VXLAN and is forwarded to interfaces within the same VXLAN.



**NOTE:** You must explicitly configure the replication of unknown unicast traffic in a Contrail environment.

- (This scenario applies only to Juniper Networks devices that can function as a Layer 3 VXLAN gateway in an OVSDB-VXLAN environment.) Layer 3 multicast traffic that is received by an integrated routing and bridging (IRB) interface in an OVSDB-managed VXLAN and is forwarded to interfaces in another OVSDB-managed VXLAN.

By default, Layer 2 BUM traffic that originates in an OVSDB-managed VXLAN is handled by one or more software virtual tunnel endpoints (VTEPs), service nodes, or top-of-rack service nodes (TSNs) in the same VXLAN. (In this topic, software VTEPs, service nodes, and TSNs are known collectively as *replicators*.) The table for remote multicast media access control (MAC) addresses in the OVSDB schema for physical devices contains only one entry that has the keyword **unknown-dst** as the MAC string and a list of replicators.

Given the previously described table entry, Layer 2 BUM traffic received on an interface in the OVSDB-managed VXLAN is forwarded to one of the replicators. The replicator to which a BUM packet is forwarded is determined by the Juniper Networks device on which the OVSDB-managed VXLAN is configured. On receiving the BUM packet, the entity replicates the packet and forwards the replicas to all interfaces within the VXLAN.

Instead of using replicators, you can optionally enable ingress node replication to handle Layer 2 BUM traffic on Juniper Networks devices that support OVSDB.



**NOTE:** Ingress node replication is supported on all Juniper Networks devices that support OVSDB except the QFX Series switches.

With ingress node replication enabled, on receiving a Layer 2 BUM packet on an interface in an OVSDB-managed VXLAN, the Juniper Networks device replicates the packet and then forwards the replicas to all software VTEPs included in the unicast MACs remote table in the OVSDB schema. The software VTEPs then forward the replicas to all virtual machines (VMs), except service VMs, or nodes, on the same host.



**NOTE:** When Juniper Networks devices replicate Layer 2 BUM packets to a large number of remote software VTEPs, the performance of the Juniper Networks devices can be impacted.

On IRB interfaces that forward Layer 3 multicast traffic from one OVSDB-managed VXLAN to another, ingress node replication is automatically implemented. With ingress node replication, the Juniper Networks device replicates a Layer 3 multicast packet and then the IRB interface forwards the replicas to all hardware and software VTEPs, but not to service nodes, in the other OVSDB-managed VXLAN. For the routing of Layer 3 multicast traffic from one OVSDB-managed VXLAN to another, ingress node replication is the only option and does not need to be configured.

- Related Documentation**
- *Configuring OVSDB-Managed VXLANs*
  - *Understanding BFD in a VMware NSX Environment with OVSDB and VXLAN*

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## Understanding Dynamically Configured VXLANs in an OVSDB Environment

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**NOTE:** This topic applies only to QFX Series switches, which support the dynamic configuration of Open vSwitch Database (OVSDB)-managed Virtual Extensible LANs (VXLANs). Although the configuration of OVSDB-managed VXLANs is automated on these switches, there are tasks that you must perform before and after the dynamic configuration.

On all other Juniper Networks devices that support OVSDB and VXLAN, you must manually configure OVSDB-managed VXLANs using the Junos OS CLI. For more information about manually configuring OVSDB-managed VXLANs, see *Configuring OVSDB-Managed VXLANs*.

The Juniper Networks Junos OS implementation of the OVSDB management protocol provides a means through which Juniper Networks devices that support OVSDB can communicate with software-defined networking (SDN) controllers. Support for OVSDB enables the devices in a physical network to be integrated into a virtualized network.

In a Junos OS environment, the concept of an OVSDB-managed Layer 2 broadcast domain in which data flows are limited to that domain is known as a *VXLAN*. The term used for the same concept in other OVSDB environments depends on the environment:

- In an NSX environment, the same concept is known as a *logical switch*.
- In a Contrail environment, the same concept is known as a *virtual network*.

Understanding the terminology used in the different environments will help you to better understand the workflow associated with the dynamic configuration of OVSDB-managed VXLANs, including tasks that you must perform before and after the dynamic configuration.

The following sections describe the dynamic configuration of OVSDb-managed VXLANs:

- [Performing Tasks Before and After the Dynamic Configuration of OVSDb-Managed VXLANs on page 19](#)
- [What the Juniper Networks Switch Actually Creates Dynamically on page 23](#)

## Performing Tasks Before and After the Dynamic Configuration of OVSDb-Managed VXLANs

Although the configuration of OVSDb-managed VXLANs is automated, there are some tasks that you must perform before and after the dynamic configuration.

[Table 4 on page 19](#) includes a sequentially ordered workflow of tasks and events for the dynamic configuration of OVSDb-managed VXLANs in an NSX environment, while [Table 5 on page 21](#) includes the equivalent information for a Contrail environment. Your familiarity with these workflows will ensure that the dynamic configuration of OVSDb-managed VXLANs is properly implemented.

In [Table 4 on page 19](#), the NSX controller and Juniper Networks switch handle the events described in workflow numbers 4, 6, and 7. You must perform the tasks described in workflow numbers 1, 2, 3, 5, and 8. If you perform a task in a different order than that outlined in [Table 4 on page 19](#), the dynamic configuration might not work or the dynamically configured OVSDb-managed VXLAN might not become functional.

**Table 4: Workflow of Tasks and Events for the Dynamic Configuration of OVSDb-Managed VXLANs in an NSX Environment**

Workflow Number	Task or Event	How Task or Event Is Handled	More Information About Task or Event
1	Enable the Juniper Networks switch to dynamically configure an OVSDb-managed VXLAN.	You must manually enable this capability by entering the <b>set switch-options ovldb-managed</b> configuration mode command on the switch.	—
2	On the Juniper Networks switch, configure each physical interface that is connected to a physical server so that the interface is managed by OVSDb.	For each physical interface, you must manually enter the <b>set protocols ovldb interfaces interface-name</b> configuration mode command.	When entering the interface name, you do not need to include a logical unit number.
3	For each OVSDb-managed VXLAN that you want to implement, configure a logical switch.	You must manually configure the logical switch by using NSX Manager or the NSX API. See the documentation that accompanies NSX Manager or the NSX API.	A universally unique identifier (UUID) for the logical switch is dynamically generated.

**Table 4: Workflow of Tasks and Events for the Dynamic Configuration of OVSDB-Managed VXLANs in an NSX Environment (continued)**

Workflow Number	Task or Event	How Task or Event Is Handled	More Information About Task or Event
4	Relevant information about the logical switch is pushed to the Juniper Networks switch.	The NSX controller pushes relevant information to the logical switch table in the OVSDB schema for physical devices. This schema resides in the Juniper Networks switch.	—
5	Create the following entities: <ul style="list-style-type: none"> <li>For each Juniper Networks switch that you deploy as a hardware VTEP, you create a gateway.</li> <li>For each OVSDB-managed interface that you configured in workflow number 2, you create a gateway service.</li> <li>For each interface that you plan to implement for a VXLAN, configure a logical switch port.</li> </ul>	You must manually configure these entities by using NSX Manager or the NSX API. See the documentation that accompanies NSX Manager or the NSX API. Also see <i>VMware NSX Configuration for Juniper Networks Devices Functioning as Virtual Tunnel Endpoints</i> .	—
6	Relevant information about the gateway service and logical switch port are pushed to the Juniper Networks switch.	The NSX controller pushes this information to the Juniper Networks switch.	—
7	A corresponding VXLAN is dynamically created. Based on the gateway service and logical switch port configured in NSX Manager or the NSX API, one or more interfaces are also created and associated with the VXLAN.	The Juniper Networks switch dynamically creates the VXLAN and interface configuration.	For the name of the VXLAN, the Juniper Networks switch uses the UUID of the logical switch.
8	(Recommended) Verify that the logical switch, corresponding VXLAN, and associated interfaces are configured properly and are operational.	You can enter the <b>show ovssdb logical-switch</b> operational mode command on the Juniper Networks switch. In the output, check the Flags field for the logical switches that you configured as described in workflow number 3 to ensure that it displays Created by both.	If the output of the <b>show ovssdb logical-switch</b> operational mode command does not include the Created by both state, see <a href="#">“Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN”</a> on page 58.

In [Table 5 on page 21](#), the Contrail controller and Juniper Networks switch handle the events described in workflow numbers 5, 8, and 9. You must perform all other tasks described in the table. If you perform a task in a different order than that outlined in [Table 5 on page 21](#), the dynamic configuration might not work or the dynamically configured OVSDb-managed VXLAN might not become functional.



**NOTE:** Although you can perform the Contrail configurations outlined in [Table 5 on page 21](#) in the Contrail Web user interface or in the Contrail REST API, [Table 5 on page 21](#) only describes how to perform tasks in the Contrail Web user interface.

**Table 5: Workflow of Tasks and Events for the Dynamic Configuration of OVSDb-Managed VXLANs in a Contrail Environment**

Workflow Number	Task or Event	How Task or Event Is Handled	More Information About Task or Event
1	On the Juniper Networks switch, configure a unique hostname for the switch.	You must manually enter the <b>set system host-name</b> <i>host-name</i> configuration mode command on the switch.	If implementing a virtual chassis, be aware that all members of the virtual chassis must have the same hostname.
2	Enable the Juniper Networks switch to dynamically configure an OVSDb-managed VXLAN.	You must manually enable this capability by entering the <b>set switch-options</b> <b>ovsdb-managed</b> configuration mode command on the switch.	—
3	On the Juniper Networks switch, configure each physical interface that is connected to a physical server so that the interface is managed by OVSDb.	For each physical interface, you must manually enter the <b>set protocols ovsdb interfaces</b> <i>interface-name</i> configuration mode command.	When entering the interface name, you do not need to include a logical unit number.
4	For each OVSDb-managed VXLAN that you want to implement, configure a virtual network in the Contrail Web user interface.	You must manually configure the virtual network by navigating to Configure > Networking > Networks.  See <a href="#">Creating a Virtual Network</a> .	See “ <a href="#">Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs</a> ” on page 35.
5	Relevant information about the virtual network is pushed to the Juniper Networks switch.	The Contrail controller pushes relevant information to the logical switch table in the OVSDb schema for physical devices. This schema resides in the Juniper Networks switch.	—

**Table 5: Workflow of Tasks and Events for the Dynamic Configuration of OVSDB-Managed VXLANs in a Contrail Environment (continued)**

Workflow Number	Task or Event	How Task or Event Is Handled	More Information About Task or Event
6	For each interface that you plan to implement for a VXLAN, configure a logical interface.	<p>In the Contrail Web user interface, you must manually configure the logical interface by navigating to Configure &gt; Physical Devices &gt; Interfaces.</p> <p>For information about configuring a logical interface, see <a href="#">Using TOR Switches and OVSDB to Extend the Contrail Cluster to Other Instances</a>.</p>	See “Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35.
7	For each Juniper Networks switch that you deploy as a hardware VTEP, you create a physical router.	<p>In the Contrail Web user interface, you must manually configure the physical router by navigating to Configure &gt; Physical Devices &gt; Physical Routers.</p> <p>For information about configuring a physical router, see <a href="#">Using TOR Switches and OVSDB to Extend the Contrail Cluster to Other Instances</a>.</p>	See “Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35.
8	Relevant information about the logical interfaces is pushed to the Juniper Networks switch.	The Contrail controller pushes this information to the Juniper Networks switch.	—
9	A corresponding VXLAN is dynamically created. Based on the logical interface configured in the Contrail Web user interface, one or more interfaces are also created and associated with the VXLAN.	The Juniper Networks switch dynamically creates the VXLAN and interface configurations.	For the name of the VXLAN, the Juniper Networks switch uses the prefix “Contrail-” and the UUID of the virtual network.
10	(Recommended) Verify that the virtual network, corresponding VXLAN, and interfaces are configured properly and are operational.	You can enter the <b>show ovssdb logical-switch</b> operational mode command on the Juniper Networks switch. In the output, check the Flags field for the virtual network that you configured as described in workflow number 4 to ensure that it displays Created by both.	If the output of the <b>show ovssdb logical-switch</b> operational mode command does not include the Created by both state, see “Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN” on page 58.

## What the Juniper Networks Switch Actually Creates Dynamically

When a Juniper Networks switch creates a VXLAN, it sets up a configuration similar to the following sample:

```
set vlans 28805c1d-0122-495d-85df-19abd647d772 vxlan vni 100
```

Note the following meanings for this sample configuration:

- The name of the VXLAN is 28805c1d-0122-495d-85df-19abd647d772. The UUID of the logical switch, which was configured in NSX Manager or in the NSX API, is 28805c1d-0122-495d-85df-19abd647d772. For a VXLAN created in a Contrail environment, the name would be preceded by “Contrail-”.
- For the virtual network identifier (VNI), the Juniper Networks switch uses either the VNI specified in the logical switch configuration (NSX) or the VXLAN identifier specified in the virtual network configuration (Contrail). In this example, VNI 100 is used. If the Juniper Networks switch detects that VNI 100 is a duplicate of a VNI from a VXLAN configured by manually using the **set vlans *vlan-name* vxlan vni (1–16777214)** command in the Junos OS CLI, the switch deletes the manually configured VXLAN. Or, if the Juniper Networks switch detects that VNI 100 is specified in the dynamically configured VXLAN, but for some reason, the VNI is no longer in the equivalent logical switch or virtual network configuration, the Juniper Networks switch deletes VNI 100 from the VXLAN.

If you need to modify or delete an OVSDb-managed VXLAN that was dynamically configured by the Juniper Networks switch, you must modify or delete either the corresponding logical switch configuration (NSX), or the corresponding virtual network configuration (Contrail). After you modify or delete the configuration, the SDN controller pushes the update to the Juniper Networks switch, and the switch modifies or deletes its configuration accordingly.

Depending on either the gateway service and logical switch ports configuration (NSX), or the logical interface configuration (Contrail), the Juniper Networks switch dynamically creates and associates one or more interfaces with the VXLAN. The configuration generated by the switch depends on whether an interface must support untagged or tagged packets. The following sections provide information about the configuration that the switch dynamically generates for each interface:

- [Dynamic Association of a Trunk Interface Supporting Untagged Packets to a Dynamically Created VXLAN on page 23](#)
- [Dynamic Association of a Trunk Interface Supporting Tagged Packets to a Dynamically Created VXLAN on page 24](#)

### Dynamic Association of a Trunk Interface Supporting Untagged Packets to a Dynamically Created VXLAN

To determine the type of interface to create and associate with an OVSDb-managed VXLAN, the Juniper Networks switch uses the VLAN ID that you specified when configuring either the logical switch port (NSX), or the logical interface (Contrail). If you specified **0** as the VLAN ID, the switch dynamically configures a trunk interface that can handle

untagged packets. (If you specified a valid non-zero VLAN ID, the switch creates a trunk interface that handles tagged packets.)

After the SDN controller pushes either the NSX or Contrail configurations to the Juniper Networks switch, the switch dynamically creates a configuration similar to the following:

```
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 native-vlan-id 4094
set interfaces ge-1/0/0 encapsulation extended-vlan-bridge
set interfaces ge-1/0/0 unit 0 vlan-id 4094
set vlans 28805c1d-0122-495d-85df-19abd647d772 interface ge-1/0/0.0
```

This sample configuration sets up physical interface ge-1/0/0 as a trunk interface. It also configures a native VLAN with an ID of 4094 and specifies that logical interface ge-1/0/0.0 is a member of the native VLAN. As a result, logical interface ge-1/0/0.0 handles incoming untagged packets.



**NOTE:** We reserve VLAN ID 4094 for native VLANs in an OVSDb environment. As a result, when you create either a logical switch port (NSX) or a logical interface (Contrail), if you specify VLAN ID 4094, the Juniper Networks switch does not dynamically configure a corresponding interface. Also, a system log error message is generated.

Instead of dynamically configuring physical interface ge-1/0/0 as an access interface, which typically handles untagged packets, the Juniper Networks switch configures it as a trunk interface. The intent of this configuration is to support the division of physical interface ge-1/0/0 into multiple logical interfaces, some of which are associated with VXLANs that handle untagged packets and some of which are associated with VXLANs that handle tagged packets.

The sample configuration also creates logical interface ge-1/0/0.0 and associates this interface with VXLAN 28805c1d-0122-495d-85df-19abd647d772.

### **Dynamic Association of a Trunk Interface Supporting Tagged Packets to a Dynamically Created VXLAN**

---

Starting with Junos OS Release 14.1X53-D15 for QFX5100 switches, 15.1X53-D10 for QFX10002 switches, 15.1X53-D30 for QFX10008 switches, 15.1X53-D60 for QFX10016 switches, 15.1X53-D210 for QFX5110 and QFX5200 switches, and 18.1R1 for QFX5210 switches, the dynamic configuration of trunk interfaces and their association with an OVSDb-managed VXLAN is supported.

In a network that is divided into multiple VXLANs, each VXLAN has a VLAN ID associated with it. Packets associated with a particular VXLAN include the corresponding tag. In this situation, the interface that connects the Juniper Networks switch to a physical server in an OVSDb environment is a trunk interface that handles only tagged packets.

To determine the type of interface to create and associate with an OVSDb-managed VXLAN, the Juniper Networks switch uses the VLAN ID that you specified when configuring either the logical switch port (NSX), or the logical interface (Contrail). If you specified a valid VLAN ID other than 0 in either configuration, the switch creates a trunk interface



that can handle tagged packets. (If you specified 0 as the VLAN ID, the switch creates a trunk interface that handles untagged packets.)

After the SDN controller pushes the NSX or Contrail configuration to the Juniper Networks switch, the switch dynamically creates a configuration similar to the following:

```
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 encapsulation extended-vlan-bridge
set interfaces ge-1/0/0 unit 10 vlan-id 10
set vlans 28805c1d-0122-495d-85df-19abd647d772 interfaces ge-1/0/0.10
```

The sample configuration sets up physical interface ge-1/0/0 as a trunk interface. It also configures a VLAN with an ID of 10 and specifies that interface ge-1/0/0.10 is a member of the VLAN. With the configuration of VLAN 10, logical interface ge-1/0/0.10 accepts incoming packets with a VLAN tag of 10 and adds a tag of 100 to each packet. Adding a tag of 100 identifies the packets as received by the VXLAN

28805c1d-0122-495d-85df-19abd647d772, which has a VNI of 100. This configuration also associates the trunk interface with VXLAN

28805c1d-0122-495d-85df-19abd647d772.

#### Release History Table

Release	Description
14.1X53-D15	Starting with Junos OS Release 14.1X53-D15 for QFX5100 switches, 15.1X53-D10 for QFX10002 switches, 15.1X53-D30 for QFX10008 switches, 15.1X53-D60 for QFX10016 switches, 15.1X53-D210 for QFX5110 and QFX5200 switches, and 18.1R1 for QFX5210 switches, the dynamic configuration of trunk interfaces and their association with an OVSDb-managed VXLAN is supported.

- Related Documentation**
- [Understanding the OVSDb Protocol Running on Juniper Networks Devices on page 14](#)
  - [show ovssdb logical-switch on page 86](#)

## OVSDb Schema for Physical Devices

An Open vSwitch Database (OVSDb) server runs on a Juniper Networks device that supports the OVSDb management protocol. When this device is connected to one or more SDN controllers, the connections provide a means through which the Juniper Networks device and the SDN controllers can communicate.

Juniper Networks devices that support OVSDb and SDN controllers exchange control and statistical data. This data is stored in the OVSDb database schema defined for physical devices. The schema resides in the OVSDb server. The schema includes several tables. Juniper Networks devices and SDN controllers, both of which have OVSDb clients, can add rows to the tables as well as monitor the tables for the addition, deletion, and modification of rows.

For example, the OVSDb client on a Juniper Networks device and an SDN controller can collect MAC routes learned by entities in the physical or virtualized networks, respectively, and publish the routes to the appropriate table in the schema. By using the MAC routes and other information provided in the table, Juniper Networks devices in the physical

network and entities in the virtualized network can determine where to forward virtual machine (VM) traffic.

Some of the OVSDB table names include the words *local* or *remote*—for example, the *unicast MACs local table* and the *unicast MACs remote table*. Information in *local* tables is learned by a Juniper Networks device that functions as a hardware virtual tunnel endpoint (VTEP), whereas information in *remote* tables is learned by other software or hardware VTEPs.

[Table 6 on page 26](#) describes the tables in the schema, the physical or virtual entity that is the source of the data provided in the table, and the command that you can enter in the CLI of the Juniper Networks device to get similar information.

**Table 6: OVSDB Schema Tables**

Table Name	Description	Source of Information	Command
Global table	Includes the top-level configuration for the Juniper Networks device.	Juniper Networks device	—
Manager table	Includes information about each SDN controller that is connected to the Juniper Networks device.	Juniper Networks device	<a href="#">show ovssdb controller</a>
Physical switch table	Includes information about a Juniper Networks device that functions as a hardware VTEP. This table includes information only for the device on which the table resides.	Juniper Networks device	—
Physical port table	Includes information about OVSDB-managed interfaces.	Juniper Networks device	<a href="#">show ovssdb interface</a>
Logical switch table	Includes the following information: <ul style="list-style-type: none"> <li>Logical switches, which you configured in a VMware NSX environment, or virtual networks, which you configured in a Contrail environment.</li> <li>The equivalent VXLANs, which were configured on the Juniper Networks device.</li> </ul>	<ul style="list-style-type: none"> <li>SDN controller</li> <li>Juniper Networks device</li> </ul>	<a href="#">show ovssdb logical-switch</a>
Logical binding statistics table	Includes statistics for OVSDB-managed interfaces.	Juniper Networks device	<a href="#">show ovssdb statistics interface</a>

Table 6: OVSDb Schema Tables (continued)

Table Name	Description	Source of Information	Command
Physical locator table	Includes information about Juniper Networks devices configured as hardware VTEPs, software VTEPs, and service nodes in an NSX environment.	Juniper Networks device	<a href="#">show ovssdb virtual-tunnel-end-point</a>
Physical locator set table	Includes a list of software VTEPs, service nodes, or top-of-rack service nodes (TSNs) for a logical switch.	Juniper Networks device	—
Unicast MACs remote table	Reachability information, including unicast MAC addresses, for entities in the virtualized network.	SDN controller	<a href="#">show ovssdb mac</a>
Unicast MACs local table	Reachability information, including unicast MAC addresses, for entities in the physical network.	Juniper Networks device	<a href="#">show ovssdb mac</a>
Multicast MACs remote table	Includes only one row. In this row, the MAC column includes the keyword <b>unknown dst</b> along with a list of software VTEPs, service nodes, or TSNs, which handle multicast traffic.	SDN controller	<a href="#">show ovssdb mac</a>
Multicast MACs local table	<p>Includes one row for each logical switch. In this row, the MAC column includes the keyword <b>unknown dst</b> and a list of hardware VTEPs, which are identified by the IP address assigned to the hardware VTEP loopback interface (lo0). These hardware VTEPs can terminate or originate a VXLAN tunnel.</p> <p>The Multicast MACs local table is introduced in Junos OS Release 14.1X53-D25 for QFX5100 switches and in Junos OS Release 14.2R4 for MX Series routers and EX9200 switches. For all other QFX switches that support OVSDb, this table is present when OVSDb support is introduced.</p>	Juniper Networks device	<a href="#">show ovssdb mac</a>

Table 6: OVSDB Schema Tables (continued)

Table Name	Description	Source of Information	Command
Tunnel table	<p><b>NOTE:</b> Only the Juniper Networks switches that support OVSDB with BFD in turn support this table.</p> <p>Includes information about tunnels through which BFD control messages are transmitted between the hardware VTEP and entities that replicate and forward BUM packets (software VTEPs and service nodes) within an OVSDB-managed VXLAN. Using BFD, the hardware VTEP can determine which replicators are reachable.</p>	Juniper Networks device	<b>show ovbdb tunnels</b>

## Release History Table

Release	Description
<a href="#">14.1X53-D25</a>	The Multicast MACs local table is introduced in Junos OS Release 14.1X53-D25 for QFX5100 switches and in Junos OS Release 14.2R4 for MX Series routers and EX9200 switches. For all other QFX switches that support OVSDB, this table is present when OVSDB support is introduced.

## Related Documentation

- [Understanding the OVSDB Protocol Running on Juniper Networks Devices on page 14](#)
- [Understanding How to Set Up OVSDB Connections on a Juniper Networks Device on page 15](#)

## PART 2

# Configuration

- [Configuring OVSDB and VXLAN on page 31](#)



## CHAPTER 2

# Configuring OVSDB and VXLAN

- Installing OVSDB on Juniper Networks Devices on page 31
- Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers on page 32
- Setting Up OVSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs on page 34
- Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs on page 35
- Example: Setting Up a VXLAN Layer 2 Gateway and OVSDB Connections in a Contrail Environment (Trunk Interfaces That Support Untagged Packets) on page 38
- Example: Setting Up a VXLAN Layer 2 Gateway and OVSDB Connections in a Contrail Environment (Trunk Interfaces That Support Tagged Packets) on page 47
- Verifying That a Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN Are Working Properly on page 57
- Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN on page 58

## Installing OVSDB on Juniper Networks Devices

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**NOTE:** The Open vSwitch Database (OVSDB) software is included in the `jsdn` package. For some Juniper Networks devices, the `jsdn` package is included in the Junos OS software (`jinstall`) package. On these Juniper Networks devices, you do not need to install the separate `jsdn` package, which means that you can skip the task described in this topic. For information about which devices do not require installation of the separate `jsdn` package, see [“OVSDB Support on Juniper Networks Devices” on page 13](#).

If the `jsdn` package for your Juniper Networks device is not included in the `jinstall` package, you must copy a separate `jsdn` package to the Juniper Networks device and then install the package. The package name uses the following format:

`jsdn-packageID-release`

where:

- *packageID* identifies the package that must run on each Juniper Networks device.
- *release* identifies the release; for example, 16.2. The **jsdn** package release and the **jinstall** release running on the device must be the same.

To install the **jsdn** package on a Juniper Networks device:

1. Download the software package to the Juniper Networks device.
2. If an older **jsdn** package already exists on the Juniper Networks device, remove the package by issuing the **request system software delete** operational mode command.

```
user@device> request system software delete existing-ovsdb-package
```

3. Install the new **jsdn** package by using the **request system software add** operational mode command.

```
user@device> request system software add path-to-ovsdb-package
```

- Related Documentation**
- [Understanding the OVSDB Protocol Running on Juniper Networks Devices on page 14](#)
  - [OVSDB and VXLAN Configuration Workflows for VMware NSX Environment](#)

---

## Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers

---

To secure a connection between a Juniper Networks device that supports the Open vSwitch Database (OVSDB) management protocol and one or more software-defined networking (SDN) controllers, the following Secure Sockets Layer (SSL) files must be present in the **/var/db/certs** directory on the device:

- **vtep-privkey.pem**
- **vtep-cert.pem**
- **ca-cert.pem**

You must create the **vtep-privkey.pem** and **vtep-cert.pem** files for the device and then install the two files in the **/var/db/certs** directory on the device.

Upon initial connection between a Juniper Networks device with OVSDB implemented and an SDN controller, the **ca-cert.pem** file is automatically generated and then installed in the **/var/db/certs** directory on the device.



**NOTE:** The situation at your particular site determines the possible methods that you can use to create the **vtep-privkey.pem** and **vtep-cert.pem** files and install them in the Juniper Networks device. Instead of providing procedures for all possible situations, this topic provides a procedure for one common scenario.

---



The procedure provided in this topic uses the OpenFlow public key infrastructure (PKI) management utility `ovs-pki` on a Linux computer to initialize a PKI and create the **`vtep-privkey.pem`** and **`vtep-cert.pem`** files. (If you have an existing PKI on your Linux computer, you can skip the step to initialize a new one.) By default, the utility initializes the PKI and places these files in the `/usr/local/share/openvswitch/pki` directory of the Linux computer.

To create and install an SSL key and certificate on a Juniper Networks device:

1. Initialize a PKI if one does not already exist on your Linux computer.

```
# ovs-pki init
```

2. On the same Linux computer on which the PKI exists, create a new key and certificate for the Juniper Networks device.

```
# ovs-pki req+sign vtep
```

3. Copy only the **`vtep-privkey.pem`** and **`vtep-cert.pem`** files from the Linux computer to the `/var/db/certs` directory on the Juniper Networks device.

**Related Documentation** • [Understanding How to Set Up OVSDDB Connections on a Juniper Networks Device on page 15](#)

## Setting Up OVSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs

---

To implement the Open vSwitch Database (OVSDB) management protocol on a Juniper Networks device, you must configure a connection between the Juniper Networks device and a software-defined networking (SDN) controller using the Junos OS CLI.

All SDN controller connections are made on the management interface of the Juniper Networks device. This connection is secured by using the Secure Sockets Layer (SSL) protocol. The default port number for the connection is 6632.

You must also specify that each physical interface that is connected to a physical server is managed by OVSDB. By performing this configuration, you essentially disable the Juniper Networks device from learning about other Juniper Networks devices that function as hardware virtual tunnel endpoints (VTEPs) and the MAC addresses learned by the hardware VTEPs. Instead, this configuration enables OVSDB to learn about these elements.

Before setting up OVSDB on a Juniper Networks device, you must do the following:

- Create an SSL private key and certificate, if they do not already exist, and install them in the `/var/db/certs` directory of the Juniper Networks device. See [“Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers”](#) on page 32.

To set up OVSDB on a Juniper Networks device:

1. Specify the IP address of the SDN controller.

```
[edit protocols ovbdb]
user@host# set controller ip-address
```

2. Specify SSL as the protocol that secures the connection between the Juniper Networks device and the SDN controller.

```
[edit protocols ovbdb]
user@host# set controller ip-address protocol ssl
```

3. Set the number of the port over which the connection to the SDN controller is made.

```
[edit protocols ovbdb]
user@host# set controller ip-address protocol ssl port number
```

4. (Optional) Specify (in milliseconds) how long the connection can be inactive before an inactivity probe is sent.

```
[edit protocols ovbdb]
user@host# set controller ip-address inactivity-probe-duration milliseconds
```

5. (Optional) Specify (in milliseconds) how long the device must wait before it can try to connect to the SDN controller again if the previous attempt failed.

```
[edit protocols ovssdb]
user@host# set controller ip-address maximum-backoff-duration milliseconds
```

6. (Optional) Repeat Steps 1 through 5 to configure a connection to an additional SDN controller in the NSX environment.
7. Specify that each physical interface that is connected to a physical server is managed by OVSDb.

```
[edit protocols ovssdb]
user@host# set interfaces interface-name
```

When specifying the *interface-name*, you do not need to include a logical unit number.

8. Complete the remaining configuration tasks, which are described in *OVSDb and VXLAN Configuration Workflows for VMware NSX Environment*.

## Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs

When extending a Contrail topology to include physical servers that are connected to a Juniper Networks switch that supports the Open vSwitch Database (OVSDb) management protocol and Virtual Extensible LANs (VXLANs), you must perform the following tasks in the Contrail Web user interface:

- For each OVSDb-managed VXLAN that you plan to implement on the Juniper Networks switch, configure an equivalent virtual network. Also configure a logical interface to associate with the virtual network.
- Configure a physical router, which enables the Contrail controller to recognize the Juniper Networks device as a hardware virtual tunnel endpoint (VTEP).

This topic provides a high-level summary of the tasks that you must perform to configure a virtual network, logical interface, and physical router. Although you can create these virtual entities in either the Contrail Web user interface or in the Contrail REST API, this topic only describes how to perform the tasks in the Contrail Web user interface. Also, this topic does not include a complete procedure for each task. Rather, it includes key configuration details for ensuring the correct configuration of the virtual entities so that they function properly with their counterparts in the physical network.

For more information about performing the tasks described in this topic, see [Creating a Virtual Network](#) and [Using TOR Switches and OVSDb to Extend the Contrail Cluster to Other Instances](#).

This topic describes the following tasks:

- [Creating a Virtual Network on page 36](#)
- [Creating a Logical Interface on page 36](#)
- [Creating a Physical Router on page 37](#)

## Creating a Virtual Network

For each OVSDB-managed VXLAN that you plan to implement on a Juniper Networks switch, configure an equivalent virtual network in the Contrail Web user interface.

[Table 7 on page 36](#) provides key configuration details to keep in mind when you configure a virtual network.

**Table 7: Key Configuration Details for Creating a Virtual Network in the Contrail Web User Interface**

Contrail Web User Interface Navigation	Configuration Field	Configuration Details
Configure > Networking > Networks	VXLAN Identifier in Advanced Options	<ul style="list-style-type: none"> <li>In the Contrail Web user interface, you can configure a VXLAN identifier mode so that VXLAN identifiers are either automatically configured or user configured. We recommend setting this mode to user configured, which enables you to initially configure a VXLAN identifier and modify it later if needed.</li> <li>In a Junos OS environment, a VXLAN identifier is also known as a <i>VXLAN network identifier (VNI)</i>.</li> </ul>

## Creating a Logical Interface

In the Contrail Web user interface, you must create a logical interface for each virtual network that you created.

Before you start this task, you must complete the configurations of the following entities:

- The OVSDB-managed physical interfaces on the Juniper Networks device. For information about configuring OVSDB-managed interfaces on Juniper Networks devices that support the dynamic configuration of VXLANs, see [“Setting Up OVSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs” on page 34](#).
- The virtual network with which you want to associate the logical interface.

[Table 8 on page 36](#) provides a summary of key configuration details to keep in mind when you configure a logical interface.

**Table 8: Key Configuration Details for Creating a Logical Interface in the Contrail Web User Interface**

Contrail Web User Interface Navigation	Configuration Field	Configuration Details
Configure > Physical Devices > Interfaces	Type	Select <b>Logical</b> .
	Name	When you specify a logical interface name, use the same naming convention for configuring a logical interface in the Junos OS CLI. A sample logical interface name is ge-1/0/0.10.
	Parent	Select an OVSDB-managed physical interface that is configured on the Juniper Networks device.
	Logical Interface Type	Select <b>L2 Server</b> .

**Table 8: Key Configuration Details for Creating a Logical Interface in the Contrail Web User Interface (continued)**

Contrail Web User Interface Navigation	Configuration Field	Configuration Details
	VLAN ID	<ul style="list-style-type: none"> <li>If you want the logical interface to handle untagged packets, specify <b>0</b>.</li> <li>If you want the logical interface to handle tagged packets, specify <b>3</b> through <b>4000</b>.</li> </ul> <p><b>NOTE:</b> VLAN IDs 1, 2, and 4094 are reserved. As a result, you must not specify these VLAN IDs.</p>
	Virtual Network	Select the virtual network with which you want to associate the logical interface.

## Creating a Physical Router

In the Contrail Web user interface, you must create a physical router, which enables the Contrail controller to recognize a Juniper Networks switch as a hardware VTEP.

Before you start this task, you must complete the following configurations:

- On the Juniper Networks switch, configure a hostname for the switch (**set system host-name *hostname***), an IP address for the management interface (**set interfaces *management-interface-name* unit 0 family inet address *ip-address/destination prefix***), and an IP address for the loopback interface (**set interfaces lo0 unit 0 family inet address *ip-address/destination prefix***). Also, set the loopback interface as the interface that identifies the switch as the hardware VTEP (**set vtep-source interface lo0.0**).
- Configure one or more virtual networks with which you want to associate the Juniper Networks switch.

[Table 9 on page 37](#) provides a summary of key configuration details to keep in mind when you configure a physical router.

**Table 9: Key Configuration Details for Creating a Physical Router in the Contrail Web User Interface**

Contrail Web User Interface Navigation	Configuration Field	Configuration Details
Configure > Physical Devices > Physical Routers	Name	Specify the hostname that you configured on the Juniper Network switch.
	Management IP	Specify the IP address of the management interface on the Juniper Networks switch. The connection with the Contrail controller is made over this interface.
	VTEP address	Specify the IP address of the loopback interface on the Juniper Networks switch.

**Table 9: Key Configuration Details for Creating a Physical Router in the Contrail Web User Interface (continued)**

Contrail Web User Interface Navigation	Configuration Field	Configuration Details
	Virtual Network	Specify one or more virtual networks that serve as counterparts to the OVSDB-managed VXLANs that the Juniper Networks switch automatically configures.

### Example: Setting Up a VXLAN Layer 2 Gateway and OVSDB Connections in a Contrail Environment (Trunk Interfaces That Support Untagged Packets)

In a physical network, a Juniper Networks switch that supports Virtual Extensible LAN (VXLAN) can function as a hardware virtual tunnel endpoint (VTEP). In this role, the Juniper Networks switch encapsulates in VXLAN packets Layer 2 Ethernet frames received from software applications that run directly on a physical server. The VXLAN packets are tunneled over a Layer 3 transport network. Upon receipt of the VXLAN packets, software VTEPs in the virtual network de-encapsulate the packets and forward them to virtual machines (VMs).

In this VXLAN environment, you can also include Contrail controllers and implement the Open vSwitch Database (OVSDB) management protocol on the Juniper Networks switch that functions as a hardware VTEP.

The Junos OS implementation of OVSDB provides a means through which Contrail controllers and Juniper Networks switches can exchange MAC addresses of entities in the physical and virtual networks. This exchange of MAC addresses enables the Juniper Networks switch that functions as a hardware VTEP to forward traffic to software VTEPs in the virtual network and software VTEPs in the virtual network to forward traffic to the Juniper Networks switch in the physical network.

This example explains how to configure a Juniper Networks switch as a hardware VTEP, which serves as a Layer 2 gateway, and set up this switch with an OVSDB connection to a Contrail controller.

In this example, only one VXLAN is deployed. Given this scenario, the packets exchanged between an application running on a physical server and a VM in the VXLAN are untagged. Therefore, in this example, a trunk interface is used for the connection between the physical server and the switch, as well as a native VLAN. The native VLAN enables the trunk interface to handle the untagged packets.

- [Requirements on page 39](#)
- [Overview and Topology on page 40](#)
- [Non-OVSDB and Non-VXLAN Configuration on page 42](#)
- [OVSDB and VXLAN Configuration on page 43](#)
- [Verification on page 45](#)

## Requirements

This example includes the following hardware and software components:

- A physical server on which software applications directly run.
- A QFX10002 switch running Junos OS Release 15.1X53-D30 or later.
- On the Juniper Networks switch, physical interface ge-1/0/0 provides a connection to physical server 1.
- A Contrail controller.
- Contrail Web user interface.
- A vRouter that includes VMs managed by a hypervisor, which includes a software VTEP.



**NOTE:** All components in the Contrail environment (Contrail controller, TSN, Contrail Web user interface, and vRouters must be running Contrail Release 2.20 or later.

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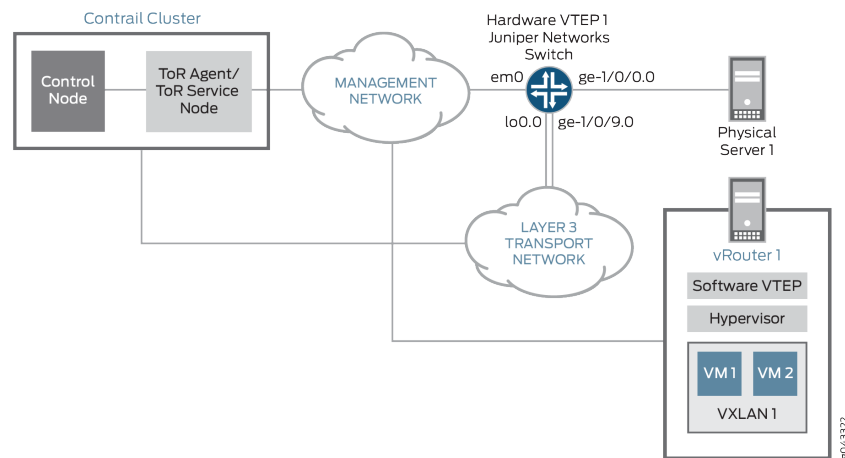
For information about the Contrail components, see [Using TOR Switches and OVSDB to Extend the Contrail Cluster to Other Instances..](#)

Before you begin:

- Create an SSL private key and certificate, if they do not already exist. The private key and certificate must be installed in the `/var/db/certs` directory of the Juniper Networks switch. See [“Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers”](#) on page 32

## Overview and Topology

Figure 2 on page 40 shows a topology in which a software application running directly on physical server 1 in the physical network needs to communicate with virtual machine VM 1 in VXLAN 1 and vice versa.



To establish communication between the software application on physical server 1 and VM 1 in VXLAN 1, a connection with a Contrail controller is configured on the management interface of the Juniper Networks switch.

Some entities in the OVSDB-VXLAN topology must be configured in both the Contrail Web user interface and on the Juniper Networks switch. Table 10 on page 40 provides a summary of the entities that must be configured and where they must be configured.



**NOTE:** The term used for an entity configured in the Contrail Web user interface can differ from the term used for essentially the same entity that is configured on the Juniper Networks switch. To prevent confusion, Table 10 on page 40 shows the Contrail Web user interface and Junos OS entities side-by-side.

**Table 10: Contrail and Junos OS Entities That Must Be Configured for a VXLAN Layer 2 Gateway Topology with OVSDB Connections and Trunk Interfaces Supporting Untagged Packets**

Entity	Entity to Be Configured in the Contrail Web User Interface	Entity to Be Configured on the Juniper Networks Switch
VXLAN 1	Virtual network for VXLAN 1	VXLAN 1
<b>NOTE:</b> The Juniper Networks switch dynamically configures this VXLAN.		



**Table 10: Contrail and Junos OS Entities That Must Be Configured for a VXLAN Layer 2 Gateway Topology with OVSDB Connections and Trunk Interfaces Supporting Untagged Packets (continued)**

Entity	Entity to Be Configured in the Contrail Web User Interface	Entity to Be Configured on the Juniper Networks Switch
Physical interface (ge-1/0/0) between physical server 1 and Juniper Networks switch	–	OVSDB management. Specify that interface ge-1/0/0 is managed by OVSDB.
One logical interface (ge-1/0/0.0) associated with VXLAN 1	One logical interface for VXLAN 1. For this interface, specify VLAN ID 0.  <b>NOTE:</b> A VLAN ID of 0 indicates that the interface must handle untagged packets.	One logical interface (ge-1/0/0.0) for VXLAN 1.  <b>NOTE:</b> The Juniper Networks switch dynamically configures this logical interface.
Juniper Networks switch (hardware VTEP 1)	Physical router	Hardware VTEP functionality. Configure the Juniper Networks switch to function as a hardware VTEP.

In the Contrail Web user interface, a virtual network is configured. In this configuration, a VXLAN identifier of 100 is specified. Also, the universally unique identifier (UUID) assigned to the virtual network is Contrail-28805c1d-0122-495d-85df-19abd647d772. Based on this configuration, the Juniper Networks switch dynamically creates the following configuration for a Junos OS-equivalent VXLAN:

```
set vlans Contrail-28805c1d-0122-495d-85df-19abd647d772 vxlan vni 100
```

Based on the logical interface configuration (VLAN number 0) in the Contrail Web user interface, the Juniper Networks switch dynamically creates the following configuration for a Junos OS-equivalent interface:

```
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 native-vlan-id 4094
set interfaces ge-1/0/0 encapsulation extended-vlan-bridge
set interfaces ge-1/0/0 unit 0 vlan-id 4094
set vlans Contrail-28805c1d-0122-495d-85df-19abd647d772 interface ge-1/0/0.0
```

This sample configuration does the following:

- Configures physical interface ge-1/0/0 as a Layer 2 trunk interface.
- Creates a native VLAN with an ID of 4094.
- Creates logical interface ge-1/0/0.0, and specifies that it is a member of the native VLAN.
- Associates logical interface ge-1/0/0.0 with VXLAN Contrail-28805c1d-0122-495d-85df-19abd647d772.

As a result of the above configuration, logical interface ge-1/0/0.0 handles incoming untagged packets.

[Table 11 on page 42](#) provides a summary of the VXLAN-OVSDB topology components that are configured on the Juniper Networks switch and the configuration settings for each component.

**Table 11: Components Configured on the Juniper Networks Switch (Hardware VTEP) in a VXLAN Layer 2 Gateway Topology with OVSDB Connections and Trunk Interfaces Supporting Untagged Packets**

Component	Setting
Contrail controller	IP address: 10.94.184.1
OVSDB-managed physical interface	Interface name: ge-1/0/0 Native VLAN ID: 4094
VXLAN 1 and associated logical interface	<p><b>NOTE:</b> The Juniper Networks switch dynamically configures the VXLAN and associated logical interface, which are based on the virtual network and associated logical interface configurations in the Contrail Web user interface. Therefore, no manual configuration is required.</p> <p>VXLAN name: Contrail-28805c1d-0122-495d-85df-19abd647d772</p> <p>VNI: 100</p> <p>Logical interface name: ge-1/0/0.0</p> <p>Interface type: trunk</p> <p>Member of native VLAN 4094</p> <p>Associated with VXLAN Contrail-28805c1d-0122-495d-85df-19abd647d772</p>
OVSDB tracing operations	<p>Filename: /var/log/ovsdb</p> <p>File size: 10 MB</p> <p>Flag: All</p>
Hardware VTEP	<p>Hostname: hw-vtep1</p> <p>Source interface: loopback (lo0.0)</p> <p>Source IP address: 10.17.17.17/32</p>
Handling of Layer 2 BUM traffic in VXLAN Contrail-28805c1d-0122-495d-85df-19abd647d772	<p>TSN</p> <p><b>NOTE:</b> By default, one or more TSNs handle Layer 2 BUM traffic within a VXLAN; therefore, no manual configuration is required.</p>

## Non-OVSDB and Non-VXLAN Configuration

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

```
set interfaces ge-1/0/9 unit 0 family inet address 10.40.40.1/24
set routing-options static route 10.19.19.19/32 next-hop 10.40.40.2
set routing-options router-id 10.17.17.17
set protocols ospf area 0.0.0.0 interface lo0.0
```

```
set protocols ospf area 0.0.0.0 interface ge-1/0/9.0
```

**Step-by-Step Procedure** To configure the Layer 3 network over which the packets exchanged between physical server 1 and VM 1 are tunneled:

1. Configure the Layer 3 interface.

```
[edit interfaces]
user@switch# set ge-1/0/9 unit 0 family inet address 10.40.40.1/24
```

2. Set the routing options.

```
[edit routing-options]
user@switch# set static route 10.19.19.19/32 next-hop 10.40.40.2
user@switch# set router-id 10.17.17.17
```

3. Configure the routing protocol.

```
[edit protocols]
user@switch# set ospf area 0.0.0.0 interface lo0.0
user@switch# set ospf area 0.0.0.0 interface ge-1/0/9.0
```

## OVSDb and VXLAN Configuration

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

```
set system host-name hw-vtep1
set switch-options ovbdb-managed
set protocols ovbdb controller 10.94.184.1
set protocols ovbdb interfaces ge-1/0/0
set protocols ovbdb traceoptions file ovbdb
set protocols ovbdb traceoptions file size 10m
set protocols ovbdb traceoptions flag all
set interfaces lo0 unit 0 family inet address 10.17.17.17/32 primary
set interfaces lo0 unit 0 family inet address 10.17.17.17/32 preferred
set switch-options vtep-source-interface lo0.0
```

**Step-by-Step Procedure** To configure the Juniper Networks switch as a hardware VTEP with an OVSDb connection to a Contrail controller:

1. Configure a unique hostname for the Juniper Networks switch.

```
[edit system]
user@switch# set host-name hw-vtep1
```

2. Enable the Juniper Networks switch to dynamically configure OVSDb-managed VXLANs and associated interfaces.

```
[edit switch-options]  
user@switch# ovsdb-managed
```

3. Configure a connection with a Contrail controller.

```
[edit protocols]  
user@switch# set ovsdb controller 10.94.184.1
```

4. Specify that the interface between hardware VTEP 1 and physical server 1 is managed by OVSDb.

```
[edit protocols]  
user@switch# set ovsdb interfaces ge-1/0/0
```

5. Set up OVSDb tracing operations.

```
[edit protocols]  
user@switch# set ovsdb traceoptions file ovsdb  
user@switch# set ovsdb traceoptions file size 10m  
user@switch# set ovsdb traceoptions flag all
```

6. Specify an IP address for the loopback interface. This IP address serves as the source IP address in the outer header of any VXLAN-encapsulated packet.

```
[edit interfaces]  
user@switch# set lo0 unit 0 family inet address 10.17.17.17/32 primary  
user@switch# set lo0 unit 0 family inet address 10.17.17.17/32 preferred
```

7. Set the loopback interface as the interface that identifies hardware VTEP 1.

```
[edit switch-options]  
user@switch# set vtep-source-interface lo0.0
```

8. In the Contrail Web user interface, configure a virtual network for VXLAN 1. See [“Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35](#).

9. In the Contrail Web user interface, configure a logical interface for the virtual network that you created in step 6. See [“Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35](#).

10. In the Contrail Web user interface, configure a physical router, which enables the Contrail controller to recognize the Juniper Networks switch as a VTEP. See [“Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35](#).

## Verification

Confirm that the configuration is working properly:

- [Verifying the Logical Switch Configuration on page 45](#)
- [Verifying the MAC Address of VM 1 on page 45](#)
- [Verifying the Contrail Controller Connection on page 46](#)
- [Verifying the OVSDB-Managed Interface on page 46](#)

### Verifying the Logical Switch Configuration

---

**Purpose** In the Contrail Web user interface, you configured a virtual network for VXLAN 1. Using the same terminology as in the OVSDB schema for physical devices, the virtual network is also known as a *logical switch*. Verify that the configuration of the logical switch with the UUID of Contrail-28805c1d-0122-495d-85df-19abd647d772 is present in the OVSDB schema and that the Flags field for the logical switch is **Created by both**.

**Action** From the operational mode, enter the **show ovssdb logical-switch** command.

```
user@switch> show ovssdb logical-switch
Logical switch information:
Logical Switch Name: Contrail-28805c1d-0122-495d-85df-19abd647d772
Flags: Created by both
VNI: 100
Num of Remote MAC: 1
Num of Local MAC: 0
```

**Meaning** The output verifies that the configuration for the logical switch is present. The **Created by both** state indicates that the virtual network was configured in the Contrail Web user interface, and that the Juniper Networks switch dynamically created the corresponding VXLAN. In this state, the virtual network and the VXLAN are operational.

If the state of the logical switch is something other than **Created by both**, see [“Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN” on page 58](#).

### Verifying the MAC Address of VM 1

---

**Purpose** Verify that the MAC address of VM 1 is present in the OVSDB schema.

**Action** From operational mode, enter the **show ovssdb mac remote** command.

```
user@switch> show ovssdb mac remote
Logical Switch Name: Contrail-28805c1d-0122-495d-85df-19abd647d772
  Mac          IP          Encapsulation  Vtep
  Address      Address      Address
a8:59:5e:f6:38:90  0.0.0.0      Vxlan over Ipv4  10.17.17.17
```

**Meaning** The output shows that the MAC address for VM 1 is present and is associated with the logical switch with the UUID of Contrail-28805c1d-0122-495d-85df-19abd647d772. Given that the MAC address is present, VM 1 is reachable through the Juniper Networks switch, which functions as a hardware VTEP.

---

### Verifying the Contrail Controller Connection

**Purpose** Verify that the connection with the Contrail controller is up.

**Action** From operational mode, enter the **show ovssdb controller** command to verify that the Contrail controller connection state is **up**.

```
user@switch> show ovssdb controller
VTEP controller information:
Controller IP address: 10.94.184.1
Controller protocol: ssl
Controller port: 6632
Controller connection: up
Controller seconds-since-connect: 542325
Controller seconds-since-disconnect: 542346
Controller connection status: active
```

**Meaning** The output shows that the state of the connection is **up**, in addition to other information about the connection. The **up** state indicates that OVSDB is enabled on the Juniper Networks switch.

---

### Verifying the OVSDB-Managed Interface

**Purpose** Verify that interface ge-1/0/0.0 is managed by OVSDB.

**Action** From operational mode, enter the **show ovssdb interface** command to verify that interface ge-1/0/0.0 is managed by OVSDb.

```
user@switch> show ovssdb interface
Interface  VLAN ID  Bridge-domain
ge-1/0/0   0          Contrail-28805c1d-0122-495d-85df-19abd647d772
```

**Meaning** The output shows that interface ge-1/0/0 is managed by OVSDb. It also indicates that the interface is associated with VXLAN Contrail-28805c1d-0122-495d-85df-19abd647d772, which has a VLAN ID of 0.

**Related Documentation**

- [Example: Setting Up a VXLAN Layer 2 Gateway and OVSDb Connections in a Contrail Environment \(Trunk Interfaces That Support Tagged Packets\) on page 47](#)

### Example: Setting Up a VXLAN Layer 2 Gateway and OVSDb Connections in a Contrail Environment (Trunk Interfaces That Support Tagged Packets)

In a physical network, a Juniper Networks switch that supports Virtual Extensible LANs (VXLANs) can function as a hardware virtual tunnel endpoint (VTEP). In this role, the Juniper Networks switch encapsulates in VXLAN packets Layer 2 Ethernet frames received from software applications that run directly on a physical server. The VXLAN packets are tunneled over a Layer 3 transport network. Upon receipt of the VXLAN packets, software VTEPs in the virtual network de-encapsulate the packets and forward the packets to virtual machines (VMs).

In this VXLAN environment, you can also include Contrail controllers and implement the Open vSwitch Database (OVSDb) management protocol on the Juniper Networks switch that functions as a hardware VTEP.

The Junos OS implementation of OVSDb provides a means through which Contrail controllers and Juniper Networks switches can exchange MAC addresses of entities in the physical and virtual networks. This exchange of MAC addresses enables the Juniper Networks switch that functions as a hardware VTEP to forward traffic to software VTEPs in the virtual network and software VTEPs in the virtual network to forward traffic to the Juniper Networks switch in the physical network.

This example explains how to configure a Juniper Networks switch as a hardware VTEP, which serves as a Layer 2 gateway, and set up this switch with an OVSDb connection to a Contrail controller.

In this example, two VXLANs are deployed. Given this scenario, the packets exchanged between the applications that are running on a physical server and the VMs in the VXLANs are tagged. As a result, trunk interfaces, which can handle the tagged packets, are used for the connection between the physical server and the Juniper Networks switch.

- [Requirements on page 48](#)
- [Overview and Topology on page 48](#)

- [Non-OVSDB and Non-VXLAN Configuration on page 52](#)
- [OVSDB and VXLAN Configuration on page 53](#)
- [Verification on page 55](#)

## Requirements

This example includes the following hardware and software components:

- A physical server on which software applications directly run.
- A QFX10002 switch running Junos OS Release 15.1X53-D30 or later.
- On the Juniper Networks switch, physical interface ge-1/0/0 provides a connection to physical server 1.
- A Contrail controller.
- A top-of-rack service node (TSN) that handles the replication and forwarding of Layer 2 broadcast, unknown unicast, and multicast (BUM) traffic within the two VXLANs used in this example.



**NOTE:** You must explicitly configure the replication of unknown unicast traffic in a Contrail environment.

- The Contrail Web user interface.
- Two vRouters that include VMs. Each vRouter is managed by a hypervisor, and each hypervisor includes a software VTEP.



**NOTE:** All components in the Contrail environment (Contrail controller, TSN, Contrail Web user interface, and vRouters) must be running Contrail Release 2.20 or later.

For information about the Contrail components, see [Using TOR Switches and OVSDB to Extend the Contrail Cluster to Other Instances](#).

Before you begin:

- Create an SSL private key and certificate, if they do not already exist. The private key and certificate must be installed in the `/var/db/certs` directory of the Juniper Networks switch. See [“Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers” on page 32](#).

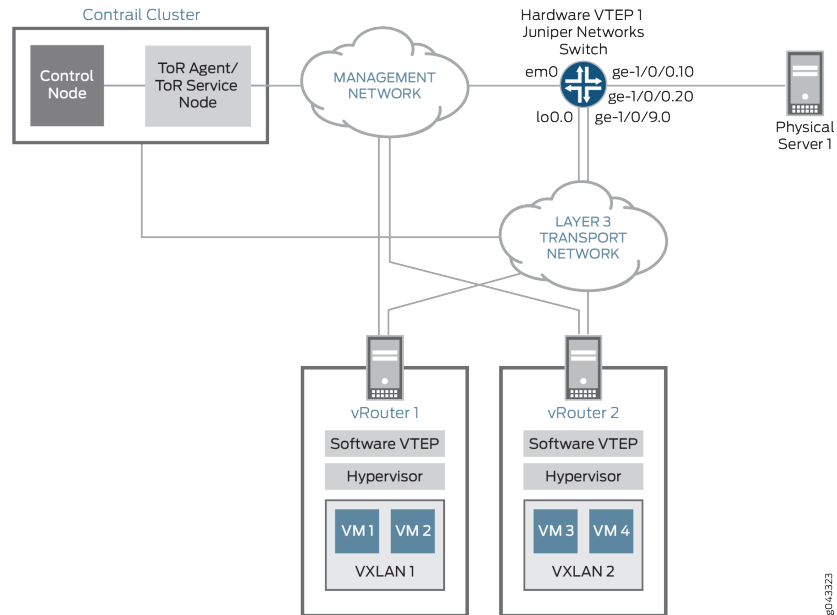
## Overview and Topology

[Figure 2 on page 40](#) shows a topology in which a software application running directly on physical server 1 in the physical network needs to communicate with virtual machine VM 1 in VXLAN 1, and vice versa; and another software application on physical server 1 needs to communicate with virtual machines VM 3 and VM 4 in VXLAN 2, and vice versa. To enable this communication, a Juniper Networks switch is configured as hardware



VTEP 1. Further, the Juniper Networks switch is connected to a Contrail controller by way of management interface em0 on the switch.

**Figure 3: VXLAN/OVSDB Layer 2 Gateway Topology**



Some entities in the VXLAN-OVSDB topology must be configured in both the Contrail Web user interface and on the Juniper Networks switch. [Table 12 on page 49](#) provides a summary of the entities that must be configured and where they must be configured.



**NOTE:** The term used for an entity that is configured in the Contrail Web user interface can differ from the term used for essentially the same entity that is configured on the Juniper Networks switch. To prevent confusion, [Table 12 on page 49](#) shows the Contrail Web user interface and the Junos OS entities side by side.

**Table 12: Contrail and Junos OS Entities That Must Be Configured for a VXLAN Layer 2 Gateway Topology with OVSDB Connections and Trunk Interfaces Supporting Tagged Packets**

Entity	Entity to Be Configured in the Contrail Web User Interface	Entity to Be Configured on the Juniper Networks Switch
VXLAN 1	Virtual network for VXLAN 1	VXLAN 1
VXLAN 2	Virtual network for VXLAN 2	VXLAN 2
		<b>NOTE:</b> The Juniper Networks switch dynamically configures these VXLANs.
Physical interface ge-1/0/0 between physical server 1 and Juniper Networks switch	—	OVSDB management. Specify that interface ge-1/0/0 is managed by OVSDB.

**Table 12: Contrail and Junos OS Entities That Must Be Configured for a VXLAN Layer 2 Gateway Topology with OVSDB Connections and Trunk Interfaces Supporting Tagged Packets (continued)**

Entity	Entity to Be Configured in the Contrail Web User Interface	Entity to Be Configured on the Juniper Networks Switch
One logical interface (ge-1/0/0.10) associated with VXLAN 1	One logical interface for VXLAN 1. For this interface, specify VLAN ID 10.	One logical interface (ge-1/0/0.10) for VXLAN 1.
One logical interface (ge-1/0/0.20) associated with VXLAN 2	One logical interface for VXLAN 2. For this interface, specify VLAN ID 20.  <b>NOTE:</b> A VLAN ID from 3 through 4000 indicates that the interface must handle tagged packets.	One logical interface (ge-1/0/0.20) for VXLAN 2.  <b>NOTE:</b> The Juniper Networks switch dynamically configures these logical interfaces.
Juniper Networks switch (hardware VTEP 1)	Physical router	Hardware VTEP functionality. Configure the Juniper Networks switch to function as a hardware VTEP.

Based on the configuration of the entities in the Contrail Web user interface as described in [Table 12 on page 49](#), the Juniper Networks switch dynamically creates VXLANs 1 and 2 and their associated logical interfaces. [Table 13 on page 50](#) provides the relevant Contrail Web user interface configuration and the resulting VXLANs and associated logical interfaces that the Juniper Networks switch dynamically configures.

**Table 13: Contrail Web User Interface Configurations and Dynamic Configurations by Juniper Networks Switch**

Contrail Web User Interface Configuration: Virtual Network and Logical Interface	VXLANs and Associated Logical Interfaces Dynamically Configured By Juniper Networks Switch
Virtual network configuration:  UUID: Contrail-28805c1d-0122-495d-85df-19abd647d772  VXLAN Identifier: 100  Logical Interface configuration:  VLAN ID: 10	For VXLAN 1:  <b>set vlans Contrail-28805c1d-0122-495d-85df-19abd647d772 vxlan vni 100</b>  For associated logical interface ge-1/0/0.10:  <b>set interfaces ge-1/0/0 flexible-vlan-tagging</b> <b>set interfaces ge-1/0/0 encapsulation extended-vlan-bridge</b> <b>set interfaces ge-1/0/0 unit 10 vlan-id 10</b> <b>set vlans Contrail-28805c1d-0122-495d-85df-19abd647d772 interfaces ge-1/0/0.10</b>
Virtual network configuration:  UUID: Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff  VXLAN Identifier: 200  Logical Interface configuration:  VLAN ID: 20	For VXLAN 2:  <b>set vlans Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff vxlan vni 200</b>  For associated logical interface ge-1/0/0.20:  <b>set interfaces ge-1/0/0 flexible-vlan-tagging</b> <b>set interfaces ge-1/0/0 encapsulation extended-vlan-bridge</b> <b>set interfaces ge-1/0/0 unit 20 vlan-id 20</b> <b>set vlans Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff interfaces ge-1/0/0.20</b>



**NOTE:** In the Contrail environment, a numerical value that identifies a VXLAN is known as a *VXLAN identifier*. In the Junos OS environment, the same numerical value is known as a *VXLAN network identifier (VNI)*.

For VXLANs 1 and 2, the Juniper Networks switch uses the UUIDs and VXLAN Identifier values that were provided for the corresponding virtual networks.

In the logical interface configurations in the Contrail Web user interface, VLAN ID values 10 and 20 and virtual network mappings are specified. As a result, the Juniper Networks switch creates logical interfaces ge-1/0/0.10 and ge-1/0/0.20, respectively. Both of these logical interfaces function as trunk interfaces that handle tagged packets. The Juniper Networks switch also maps the logical interfaces ge-1/0/0.10 and ge-1/0/0.20 to their respective VXLANs.

Based on the configurations generated by the Juniper Networks switch, interface ge-1/0/0.10 accepts packets with a VLAN tag of 10 from VXLAN 1, and interface ge-1/0/0.20 accepts packets with a VLAN tag of 20 from VXLAN 2. On receiving packets from VXLAN 1, a VLAN tag of 100 is added to the packets, and a VLAN tag of 200 is added to packets from VXLAN 2. These tags are added to the respective packet streams to map the VLAN ID in a particular VXLAN to the corresponding VNI.

[Table 11 on page 42](#) provides a summary of the components that are configured on the Juniper Networks switch. Unless noted, all configurations are performed manually in the Junos OS CLI.

**Table 14: Components Configured on Juniper Networks Switch (Hardware VTEP) in a VXLAN Layer 2 Gateway Topology with OVSDb Connections and Trunk Interfaces Supporting Tagged Packets**

Components	Settings
Contrail controller	IP address: 10.94.184.1
OVSDb-managed interface	Interface name: ge-1/0/0
VXLAN 1 and associated logical interface	<p><b>NOTE:</b> The Juniper Networks switch dynamically configures the VXLAN and associated logical interface, which are based on the virtual network and associated logical interface configurations in the Contrail Web user interface. Therefore, no manual configuration is required.</p> <p>VXLAN name: Contrail-28805c1d-0122-495d-85df-19abd647d772</p> <p>VNI: 100</p> <p>Logical interface name: ge-1/0/0.10</p> <p>VLAN ID: 10</p> <p>Interface type: trunk</p>

**Table 14: Components Configured on Juniper Networks Switch (Hardware VTEP) in a VXLAN Layer 2 Gateway Topology with OVSDB Connections and Trunk Interfaces Supporting Tagged Packets (continued)**

Components	Settings
VXLAN 2 and associated logical interface	<p><b>NOTE:</b> The Juniper Networks switch dynamically configures the VXLAN and associated logical interface, which are based on the virtual network and associated logical interface configurations in the Contrail Web user interface. Therefore, no manual configuration is required.</p> <p>VXLAN name: Contrail-VXLAN 9acc24b3-7b0a-4c2e-b572-3370c3e1acff</p> <p>VNI: 200</p> <p>Logical interface name: ge-1/0/0.20</p> <p>VLAN ID: 20</p> <p>Interface type: trunk</p>
OVSDB tracing operations	<p>Filename: /var/log/ovsdb</p> <p>File size: 10 MB</p> <p>Flag: All</p>
Hardware VTEP functionality	<p>Hostname: hw-vtep1</p> <p>Source interface: loopback (lo0.0)</p> <p>Source IP address: 10.17.17.17/32</p>
Handling of Layer 2 BUM traffic within VXLAN Contrail-28805c1d-0122-495d-85df-19abd647d772 and Contrail-VXLAN 9acc24b3-7b0a-4c2e-b572-3370c3e1acff	<p>TSN</p> <p><b>NOTE:</b> By default, one or more TSNs handle Layer 2 BUM traffic within a VXLAN; therefore, no configuration is required.</p>
Hardware VTEP source identifier	<p>Source interface: loopback (lo0.0)</p> <p>Source IP address: 10.17.17.17/32</p>
OVSDB tracing operations	<p>Filename: /var/log/ovsdb</p> <p>File size: 10 MB</p> <p>Flag: All</p>

## Non-OVSDB and Non-VXLAN Configuration

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

```
set interfaces ge-1/0/9 unit 0 family inet address 10.40.40.1/24
```

```

set routing-options static route 10.19.19.19/32 next-hop 10.40.40.2
set routing-options router-id 10.17.17.17
set protocols ospf area 0.0.0.0 interface lo0.0
set protocols ospf area 0.0.0.0 interface ge-1/0/9.0

```

**Step-by-Step Procedure** To configure the Layer 3 network over which the packets exchanged between the physical servers and VMs are tunneled:

1. Configure the Layer 3 interface.

```

[edit interfaces]
user@switch# set ge-1/0/9 unit 0 family inet address 10.40.40.1/24

```

2. Set the routing options.

```

user@switch# set static route 10.19.19.19/32 next-hop 10.40.40.2
user@switch# set router-id 10.17.17.17

```

3. Configure the routing protocol.

```

[edit protocols]
user@switch# set ospf area 0.0.0.0 interface lo0.0
user@switch# set ospf area 0.0.0.0 interface ge-1/0/9.0

```

## OVSDb and VXLAN Configuration

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

```

set system host-name hw-vtep1
set switch-options ovssdb-managed
set protocols ovssdb controller 10.94.184.1
set protocols ovssdb interfaces ge-1/0/0
set protocols ovssdb traceoptions file ovssdb
set protocols ovssdb traceoptions file size 10m
set protocols ovssdb traceoptions flag all
set interfaces lo0 unit 0 family inet address 10.17.17.17/32 primary
set interfaces lo0 unit 0 family inet address 10.17.17.17/32 preferred
set switch-options vtep-source-interface lo0.0

```

**Step-by-Step Procedure** To configure the Juniper Networks switch as a hardware VTEP with an OVSDb connection to the Contrail controller:

1. Configure a unique hostname for the Juniper Networks switch.

```

[edit system]
user@switch# set host-name hw-vtep1

```

2. Enable the Juniper Networks switch to dynamically configure OVSDB-managed VXLANs and associated interfaces.

```
[edit switch-options]  
user@switch# ovsdb-managed
```

3. Configure a connection with the Contrail controller.

```
[edit protocols]  
user@switch# set ovsdb controller 10.94.184.1
```

4. Specify that the interface between hardware VTEP 1 and physical server 1 is managed by OVSDB.

```
[edit protocols]  
user@switch# set ovsdb interfaces ge-1/0/0
```

5. Set up OVSDB tracing operations.

```
[edit protocols]  
user@switch# set ovsdb traceoptions file ovsdb  
user@switch# set ovsdb traceoptions file size 10m  
user@switch# set ovsdb traceoptions flag all
```

6. Specify an IP address for the loopback interface. This IP address serves as the source IP address in the outer header of any VXLAN-encapsulated packet.

```
[edit interfaces]  
user@switch# set lo0 unit 0 family inet address 10.17.17.17/32 primary  
user@switch# set lo0 unit 0 family inet address 10.17.17.17/32 preferred
```

7. Set the loopback interface as the interface that identifies hardware VTEP 1.

```
[edit switch-options]  
user@switch# set vtep-source-interface lo0.0
```

8. In the Contrail Web user interface, configure a virtual network for VXLAN 1 and a virtual network for VXLAN 2. See [“Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35](#).

9. In the Contrail Web user interface, configure a logical interface for each of the virtual networks that you created in Step 8. See [“Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35](#).

10. In the Contrail Web user interface, configure a physical router, which enables the Contrail controller to recognize the Juniper Networks switch as a VTEP. See [“Contrail Configuration for Juniper Networks Devices That Function as Hardware VTEPs” on page 35](#).

## Verification

Confirm that the configuration is working properly:

- [Verifying the Logical Switch Configuration on page 55](#)
- [Verifying the MAC Addresses of VM 1, VM 3, and VM 4 on page 55](#)
- [Verifying the Contrail Controller Connection on page 56](#)
- [Verifying the OVSDb-Managed Interface on page 56](#)

### Verifying the Logical Switch Configuration

**Purpose** In the Contrail Web user interface, you configured a virtual network for VXLAN 1 and a virtual network for VXLAN 2. Using the same terminology as in the OVSDb schema for physical devices, a virtual network is also known as a *logical switch*. Verify that the configuration of the logical switches with the UUIDs of Contrail-28805c1d-0122-495d-85df-19abd647d772 and Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff are present in the OVSDb schema and that the Flags field for each logical switch is **Created by both**.

**Action** Issue the `show ovssdb logical-switch` command.

```
user@switch> show ovssdb logical-switch
Logical switch information:
Logical Switch Name: Contrail-28805c1d-0122-495d-85df-19abd647d772
Flags: Created by both
VNI: 100
Num of Remote MAC: 1
Num of Local MAC: 0
Logical Switch Name: Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff
Flags: Created by both
VNI: 200
Num of Remote MAC: 2
Num of Local MAC: 0
```

**Meaning** The output verifies that the configurations for the logical switches are present. The **Created by both** state indicates that the logical switches were configured in the Contrail Web user interface, and that the Juniper Networks switch dynamically created the corresponding VXLANs. In this state, the virtual networks and VXLANs are operational.

If the state of the logical switches is something other than **Created by both**, see [“Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDb-Managed VXLAN” on page 58](#).

### Verifying the MAC Addresses of VM 1, VM 3, and VM 4

**Purpose** Verify that the MAC addresses of VM 1, VM 3, and VM 4 are present in the OVSDb schema.

**Action** Issue the **show ovssdb mac remote** operational mode command.

```
user@switch> show ovssdb mac remote
Logical Switch Name: Contrail-28805c1d-0122-495d-85df-19abd647d772
  Mac      IP      Encapsulation  Vtep
  Address  Address
a8:59:5e:f6:38:90  0.0.0.0      Vxlan over Ipv4  10.17.17.17
Logical Switch Name: Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff
  Mac      IP      Encapsulation  Vtep
  Address  Address
00:23:9c:5e:a7:f0  0.0.0.0      Vxlan over Ipv4  10.17.17.17
00:23:9c:5e:a7:f0  0.0.0.0      Vxlan over Ipv4  10.17.17.17
```

**Meaning** The output shows that the MAC addresses for VM 1, VM 3, and VM 4 are present and are associated with their respective logical switches. Given that the MAC addresses are present, VM 1, VM 3, and VM 4 are reachable through the Juniper Networks switch, which functions as a hardware VTEP.

---

### Verifying the Contrail Controller Connection

**Purpose** Verify that the connection with the Contrail controller is up.

**Action** Issue the **show ovssdb controller** operational mode command to verify that the Contrail controller connection state is **up**.

```
user@switch> show ovssdb controller
VTEP controller information:
Controller IP address: 10.94.184.1
Controller protocol: ssl
Controller port: 6632
Controller connection: up
Controller seconds-since-connect: 542325
Controller seconds-since-disconnect: 542346
Controller connection status: active
```

**Meaning** The output shows that the state of the connection is **up**, in addition to other information about the connection. By virtue of this connection being up, OVSDB is enabled on the Juniper Networks switch.

---

### Verifying the OVSDB-Managed Interface

**Purpose** Verify that interface ge-1/0/0 is managed by OVSDB.



**Action** Issue the **show ovssdb interface** operational mode command, and verify that interface ge-1/0/0 is managed by OVSDb.

```
user@switch> show ovssdb interface
Interface  VLAN ID  Bridge-domain
ge-1/0/0   10       Contrail-28805c1d-0122-495d-85df-19abd647d772
ge-1/0/0   20       Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff
```

**Meaning** The output shows that interface ge-1/0/0 is managed by OVSDb. It also indicates that the interface is associated with VXLAN **Contrail-28805c1d-0122-495d-85df-19abd647d772**, which has a VLAN ID of **10**, and VXLAN **Contrail-9acc24b3-7b0a-4c2e-b572-3370c3e1acff**, which has a VLAN ID of **20**.

**Related Documentation** • [Example: Setting Up a VXLAN Layer 2 Gateway and OVSDb Connections in a Contrail Environment \(Trunk Interfaces That Support Untagged Packets\) on page 38](#)

## Verifying That a Logical Switch and Corresponding Junos OS OVSDb-Managed VXLAN Are Working Properly

**Purpose** Verify the following:

- A logical switch, which is configured in an NSX environment, or a virtual network, which is configured in a Contrail environment, is learning MAC addresses in their respective environments.
- The corresponding OVSDb-managed Virtual Extensible LAN (VXLAN), which is configured on a Juniper Networks device, is learning MAC addresses in the Junos OS environment.
- The logical switch or virtual network and OVSDb-managed VXLAN are exchanging the MAC addresses learned in their respective environments so that virtual and physical servers can communicate.

**Action** To verify that a logical switch or virtual network and its corresponding OVSDb-managed VXLAN are learning and exchanging MAC addresses in their respective environments, enter the **show ovssdb logical-switch** operational mode command.

```
user@device> show ovssdb logical-switch
Logical switch information:
Logical Switch Name: 28805c1d-0122-495d-85df-19abd647d772
Flags: Created by both
VNI: 100
Num of Remote MAC: 1
Num of Local MAC: 0
```



**NOTE:** In the Open vSwitch Database (OVSDB) schema for physical devices, the logical switch table stores information about the Layer 2 broadcast domain that you configured in a VMware NSX or Contrail environment. In the NSX environment, the Layer 2 broadcast domain is known as a *logical switch*, while in the Contrail environment, the domain is known as a *virtual network*.

In the context of the `show ovssdb logical-switch` command, the term *logical switch* refers to the logical switch or virtual network that was configured in the NSX or Contrail environments, respectively, and the corresponding configuration that was pushed to the OVSDB schema.

**Meaning** The output in the Flags field (**Created by both**) indicates that the logical switch or virtual network and its corresponding OVSDB-managed VXLAN are both properly configured. In this state, the logical switch or virtual network and the VXLAN are learning and exchanging MAC addresses in their respective environments.

If the output in the Flags field displays a state other than **Created by both**, see [“Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN” on page 58](#).

**Related Documentation**

- [show ovssdb logical-switch on page 86](#)

---

## Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDB-Managed VXLAN

---

**Problem** **Description:** The Flags field in the `show ovssdb logical-switch` operational mode command output is one of the following:

- **Created by Controller**
- **Created by L2ALD**
- **Tunnel key mismatch**

**Cause**

- If the Flags field displays **Created by Controller**, a logical switch is configured in the NSX environment or a virtual network is configured in the Contrail environment. However, an equivalent VXLAN is not configured or is improperly configured on the Juniper Networks device.
- If the Flags field displays **Created by L2ALD**, a VXLAN is configured on the Juniper Networks device. However, an equivalent logical switch is not configured in the NSX environment or an equivalent virtual network is not configured in the Contrail environment.
- If the Flags field displays **Tunnel key mismatch**, the VXLAN network identifier (VNI) specified in the logical switch configuration or the VXLAN identifier specified in the

virtual network configuration do not match the VNI in the equivalent VXLAN configuration.

**Solution** If the Flags field displays **Created by Controller**, take the following action:

- On a QFX Series switch, verify that the **set switch-options ovbdb-managed** configuration command was issued in the Junos OS CLI. Issuing this command and committing the configuration enable the Juniper Networks device to dynamically create OVSDb-managed VXLANs.

Another possible cause is that the L2ALD daemon has become nonfunctional. If this is the case, wait for a few seconds, reissue the **show ovbdb logical-switch** operational mode command, and recheck the setting of the Flags field.

Another possible cause is that the Juniper Networks device dynamically configured the VXLAN and its associated logical interface, but there is an error in the configuration of these entities themselves or in an entity that was committed in the same transaction. If there is an issue with one or more of the configurations in a transaction, all configurations in the transaction, even the ones that are correctly configured, remain uncommitted and in a queue until you troubleshoot and resolve the configuration issues. As a result, the Juniper Networks device was unable to commit all configurations in the transaction. Starting with Junos OS Release 14.1X53-D26 for QFX5100 switches, Junos OS Release 15.1X53-D210 for QFX5110 and QFX5200 switches, and 18.1R1 for QFX5210 switches, you can enter the **show ovbdb commit failures** operational mode command to determine which configurations in a transaction are erroneous. After resolving the errors, enter the **clear ovbdb commit failures** command to remove the transaction from the queue and then retry committing all configurations in the transaction. Issues that can cause commitment errors include but are not limited to the detection of the same VXLAN name or VXLAN network identifier (VNI) in a dynamically configured VXLAN and in a VXLAN that was previously configured using the Junos OS CLI.

- On all other Juniper Networks devices that support VXLAN and OVSDb, determine whether a VXLAN equivalent to the logical switch configuration or virtual network configuration exists on the device. If the VXLAN is not configured, configure it using the procedure in *Configuring OVSDb-Managed VXLANs*. If a VXLAN is configured, check the VXLAN name to make sure that it is the same as the universally unique identifier (UUID) of the logical switch (NSX) or virtual network (Contrail) configuration. Also, check the VNI to make sure that the value is the same as the value in the logical switch (NSX) or virtual network (Contrail) configuration.

If the Flags field displays **Created by L2ALD**, take the following action:

- On a QFX Series switch, two issues exist. First, despite the fact that the Juniper Networks device dynamically creates OVSDb-managed VXLANs, this VXLAN was configured by using the Junos OS CLI. Second, a corresponding logical switch (NSX) or virtual network (Contrail) was not configured. To resolve both issues, configure a logical switch in the NSX environment or a virtual network in the Contrail environment. After the software-defined networking (SDN) controller pushes relevant logical switch or virtual

network information to the Juniper Networks device, the device dynamically creates a corresponding VXLAN and deletes the VXLAN configured using the Junos OS CLI.

- On all other Juniper Networks devices that support VXLAN and OVSDB, determine whether an equivalent logical switch is configured in the NSX environment or a virtual network is configured in the Contrail environment. If a logical switch or virtual network is not configured, configure one, keeping in mind that a UUID is automatically generated for the logical switch or virtual network and that this UUID must be used as the name of the VXLAN. That is, the VXLAN name must be reconfigured with the logical switch or virtual network UUID.

Another possibility is that the logical switch or virtual network configuration might exist, but the UUID of the entity might not match the VXLAN name. In the NSX or Contrail environment, check for a logical switch or virtual network, respectively, that has the same configuration as the VXLAN but has a different UUID.

If the Flags field displays **Tunnel key mismatch**, take the following action:

- For a QFX Series switch, check the configuration of the VNI in the NSX environment or the VXLAN identifier in the Contrail environment to see whether it was changed after the Juniper Networks device dynamically created the equivalent VXLAN. If it was changed, update the VNI on the QFX Series switch using the Junos OS CLI.
- On all other Juniper Networks devices that support VXLAN and OVSDB, check the value of the VNI in the NSX environment or the VXLAN identifier in the Contrail environment and the Junos OS CLI. Change the incorrect value.

#### Release History Table

Release	Description
14.1X53-D26	Starting with Junos OS Release 14.1X53-D26 for QFX5100 switches, Junos OS Release 15.1X53-D210 for QFX5110 and QFX5200 switches, and 18.1R1 for QFX5210 switches, you can enter the <b>show ovssdb commit failures</b> operational mode command to determine which configurations in a transaction are erroneous.

#### Related Documentation

- [Understanding Dynamically Configured VXLANs in an OVSDB Environment on page 18](#)
- [Understanding How to Manually Configure OVSDB-Managed VXLANs](#)
- [show ovssdb logical-switch on page 86](#)
- [show ovssdb commit failures on page 80](#)
- [clear ovssdb commit failures on page 78](#)

## PART 3

# Configuration Statements and Operational Commands

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- [VXLAN Configuration Statements on page 75](#)
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## CHAPTER 3

# OVSDb Configuration Statements

- [controller \(OVSDb\) on page 64](#)
- [inactivity-probe-duration on page 65](#)
- [interfaces \(OVSDb\) on page 66](#)
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- [port \(OVSDb\) on page 70](#)
- [protocol \(OVSDb\) on page 71](#)
- [traceoptions \(OVSDb\) on page 72](#)

## controller (OVSDB)

<b>Syntax</b>	<pre> controller <i>ip-address</i> {     <i>inactivity-probe-duration</i> <i>milliseconds</i>;     <i>maximum-backoff-duration</i> <i>milliseconds</i>;     protocol <i>protocol</i> {         port <i>number</i>;     } } </pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb</a> ]
<b>Release Information</b>	<p>Statement introduced in Junos OS Release 14.1R2.</p> <p>Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches.</p> <p>Statement introduced in Junos OS Release 14.2 for EX Series switches.</p>
<b>Description</b>	<p>Configure a connection between a Juniper Networks device running the Open vSwitch Database (OVSDB) management protocol and a software-defined networking (SDN) controller. You can connect a Juniper Networks device to more than one SDN controller for redundancy.</p> <p>In a VMware NSX environment, one cluster of NSX controllers typically includes three or five controllers. To implement the OVSDB management protocol on a Juniper Networks device, you must explicitly configure a connection to one NSX controller, using the Junos OS CLI. If the NSX controller to which you explicitly configure a connection is in a cluster, the controller pushes information about other controllers in the same cluster to the device, and the device establishes connections with the other controllers. However, you can also explicitly configure connections with the other controllers in the cluster, using the Junos OS CLI.</p> <p>To implement the OVSDB management protocol on a Juniper Networks device in a Contrail environment, you must configure a connection to a Contrail controller, using the Junos OS CLI.</p> <p>Connections to all SDN controllers are made on the management interface of the Juniper Networks device.</p>
<b>Options</b>	<p><i>ip-address</i>—IPv4 address of the SDN controller.</p> <p>The remaining statements are explained separately. See <a href="#">CLI Explorer</a>.</p>
<b>Required Privilege Level</b>	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">Setting Up OVSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs on page 34</a></li> </ul>



- [Setting Up the OVSDb Protocol on Juniper Networks Devices that Support Manual Configuration of VXLANs](#)
- [Understanding How to Set Up OVSDb Connections on a Juniper Networks Device on page 15](#)

## inactivity-probe-duration

<b>Syntax</b>	<code>inactivity-probe-duration <i>milliseconds</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb controller</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1R2. Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Statement introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Configure the maximum amount of time, in milliseconds, that the connection between a Juniper Networks device that supports the Open vSwitch Database (OVSDb) management protocol and a software-defined networking (SDN) controller can be inactive before an inactivity probe is sent.
<b>Options</b>	<b><i>milliseconds</i></b> —Number of milliseconds that the connection can be inactive before an inactivity probe is sent. <b>Range:</b> 0 through 4,294,967,295 <b>Default:</b> 0. This value indicates that an inactivity probe is never sent.
<b>Required Privilege Level</b>	<b>admin</b> —To view this statement in the configuration. <b>admin-control</b> —To add this statement to the configuration.
<b>Related Documentation</b>	• <a href="#">Understanding How to Set Up OVSDb Connections on a Juniper Networks Device on page 15</a>

## interfaces (OVSDB)

---

<b>Syntax</b>	<code>interfaces <i>interface-name</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1R2. Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Statement introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Specify the physical interfaces on a Juniper Networks device that you want the Open vSwitch Database (OVSDB) protocol to manage. Typically, the only interfaces that need to be managed by OVSDB are interfaces that are connected to physical servers.
<b>Options</b>	<i>interface-name</i> —Name of the interface.
<b>Required Privilege Level</b>	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <i>Setting Up the OVSDB Protocol on Juniper Networks Devices that Support Manual Configuration of VXLANs</i></li><li>• <a href="#">Setting Up OVSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs on page 34</a></li></ul>

## maximum-backoff-duration

---

<b>Syntax</b>	<code>maximum-backoff-duration <i>milliseconds</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb controller</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1R2. Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Statement introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Specify (in milliseconds) how long a Juniper Networks device that supports the Open vSwitch Database (OVSDb) management protocol waits before it tries again to connect with a software-defined networking (SDN) controller after a previous attempt has failed.
<b>Options</b>	<i>milliseconds</i> —Number of milliseconds a Juniper Networks device waits before it tries again to connect with an SDN controller. <b>Range:</b> 1000 through 4,294,967,295 <b>Default:</b> 1000
<b>Required Privilege Level</b>	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Understanding How to Set Up OVSDb Connections on a Juniper Networks Device on page 15</a></li> </ul>

## ovsdb

<b>Syntax</b>	<pre> ovsdb {   controller ip-address {     inactivity-probe-duration milliseconds;     maximum-backoff-duration milliseconds;     protocol protocol {       port number;     }   }   interfaces interface-name;   traceoptions {     file &lt;filename&gt; &lt;files number&gt; &lt;match regular-expression&gt; &lt;no-world-readable         world-readable&gt; &lt;size size&gt;;     flag flag;     no-remote-trace;   } } </pre>
<b>Hierarchy Level</b>	[edit protocols]
<b>Release Information</b>	<p>Statement introduced in Junos OS Release 14.1R2.</p> <p>Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches.</p> <p>Statement introduced in Junos OS Release 14.2 for EX Series switches.</p>
<b>Description</b>	<p>Configure support for the Open vSwitch Database (OVSDb) management protocol on a Juniper Networks device.</p> <p>The remaining statements are explained separately. See <a href="#">CLI Explorer</a>.</p>
<b>Default</b>	The OVSDb management protocol is disabled on Juniper Networks devices.
<b>Required Privilege Level</b>	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">Understanding the OVSDb Protocol Running on Juniper Networks Devices on page 14</a></li> </ul>

## ovsdb-managed


<b>Syntax</b>	ovsdb-managed;
<b>Hierarchy Level</b>	<p>[edit bridge-domains <i>bridge-domain-name</i> vxlan],          [edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i> vxlan],          [edit routing-instances <i>routing-instance-name</i> switch-options],          [edit routing-instances <i>routing-instance-name</i> vlans <i>vlan-name</i> vxlan],          [edit routing-instances <i>routing-instance-name</i> vxlan],          [edit switch-options],          [edit vlans <i>vlan-name</i> vxlan]</p>
<b>Release Information</b>	<p>Statement introduced in Junos OS Release 14.1R2.</p> <p>Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches.</p> <p>Statement introduced in Junos OS Release 14.2 for EX Series switches.</p>
<b>Description</b>	<p>Disable a Juniper Networks device from learning about other Juniper Networks devices that function as hardware virtual tunnel endpoints (VTEPs) in a specified Virtual Extensible LAN (VXLAN) and the media access control (MAC) addresses learned by the hardware VTEPs. Instead, the Juniper Networks device uses the Open vSwitch Database (OVSDb) management protocol to learn about the hardware VTEPs in the VXLAN and the MAC addresses learned by the hardware VTEPs.</p> <p>The specified VXLAN must have a VXLAN network identifier (VNI) configured, using the <b>vni</b> statement in the [edit bridge-domains <i>bridge-domain-name</i> vxlan], [edit routing-instance <i>routing-instance-name</i> vxlan], or [edit vlans <i>vlan-name</i> vxlan] hierarchy.</p> <p>Also, for OVSDb-managed VXLANs, the multicast scheme described in “<a href="#">Understanding How Layer 2 BUM and Layer 3 Routed Multicast Traffic Are Handled with OVSDb</a>” on <a href="#">page 17</a> is used. Therefore, specifying the <b>multicast-group</b> statement in the [edit bridge-domains <i>bridge-domain-name</i> vxlan], [edit routing-instances <i>routing-instance-name</i> vxlan], or [edit vlans <i>vlan-name</i> vxlan] hierarchy has no effect.</p>
<b>Required Privilege Level</b>	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Understanding Dynamically Configured VXLANs in an OVSDb Environment on page 18</a></li> <li>• <a href="#">Configuring OVSDb-Managed VXLANs</a></li> </ul>

## port (OVSDB)

---

<b>Syntax</b>	<code>port <i>number</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb controller protocol</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1R2. Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Statement introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Specify the software-defined networking (SDN) controller port to which a Juniper Networks device that supports the Open vSwitch Database (OVSDB) management protocol connects.
<b>Options</b>	<b><i>number</i></b> —Number of SDN controller port. <b>Range:</b> 1024 through 65,535 <b>Default:</b> 6632
<b>Required Privilege Level</b>	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Understanding How to Set Up OVSDB Connections on a Juniper Networks Device on page 15</a></li></ul>

## protocol (OVSDb)

<b>Syntax</b>	<code>protocol protocol {     port number; }</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb controller</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1R2. Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Statement introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	<p>Configure the security protocol that protects the connection between a Juniper Networks device that supports the Open vSwitch Database (OVSDb) management protocol and a software-defined networking (SDN) controller.</p> <p>The Secure Sockets Layer (SSL) connection requires a private key and certificates, which must be stored in the <code>/var/db/certs</code> directory of the Juniper Networks device. See <a href="#">“Creating and Installing an SSL Key and Certificate on a Juniper Networks Device for Connection with SDN Controllers”</a> on page 32.</p>
<b>Options</b>	<b>protocol</b> —Establish a secure connection to the SDN controller, using SSL or TCP.
<div>  <b>NOTE:</b> SSL is the only supported connection protocol.         </div>	
	<b>Default:</b> <code>ssl</code>
	The remaining statement is explained separately. See <a href="#">CLI Explorer</a> .
<b>Required Privilege Level</b>	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Understanding How to Set Up OVSDb Connections on a Juniper Networks Device on page 15</a></li> </ul>

## traceoptions (OVSDB)

---

<b>Syntax</b>	<pre>traceoptions {     file &lt;filename&gt; &lt;files number&gt; &lt;match regular-expression&gt; &lt;no-world-readable       world-readable&gt; &lt;size size&gt;;     flag flag;     no-remote-trace; }</pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">ovsdb</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1R2. Statement introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Statement introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Define tracing operations for the Open vSwitch Database (OVSDB) management protocol, which is supported on Juniper Networks devices.
<b>Default</b>	If you do not include this statement, OVSDB-specific tracing operations are not performed.
<b>Options</b>	<p><b>file <i>filename</i></b>—Name of file in which the system places the output of the tracing operations. By default, the system places all files in the <b>/var/log</b> directory. <b>Default:</b> <b>/var/log/vgd</b></p> <p><b>files <i>number</i></b>—(Optional) Maximum number of trace files. When a trace file reaches the size specified by the <b>size</b> option, the filename is appended with 0 and compressed. For example, a trace file named <b>trace-file.gz</b> would be renamed <b>trace-file.0.gz</b>. When <b>trace-file.0.gz</b> reaches the specified size, it is renamed <b>trace-file.1.gz</b> and its contents are compressed to <b>trace-file.0.gz</b>. This renaming scheme continues 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 also must specify a maximum file size with the <b>size</b> option and a filename. <b>Range:</b> 2 through 1000 files <b>Default:</b> 10 files</p> <p><b>flag <i>flag</i></b>—Tracing operation to perform. You can include one or more of the following flags:</p> <ul style="list-style-type: none"><li><b>all</b>—All OVSDB events.</li><li><b>configuration</b>—OVSDB configuration events.</li><li><b>core</b>—OVSDB core events.</li><li><b>function</b>—OVSDB function events.</li><li><b>interface</b>—OVSDB interface events.</li></ul>



**l2-client**—OVSDDB Layer 2 client events.

**netconf-client**—(QFX Series switches only) Events for the dynamic configuration of Virtual Extensible LANs (VXLANs).

**ovs-client**—OVSDDB client events.

**match *regular-expression***—(Optional) Only log lines that match the regular expression.

**no-remote-trace**—(Optional) Disable tracing and logging operations that track normal operations, error conditions, and packets that are generated by or passed through the Juniper Networks device.

**no-world-readable**—Restrict access to the trace files to the owner.

**Default:** no-world-readable

**size *size***—(Optional) Maximum size of each trace file in bytes, kilobytes (KB), megabytes (MB), or gigabytes (GB). If you do not specify a unit, the default is bytes. If you specify a maximum file size, you also must specify a maximum number of trace files by using the **files** option and a filename by using the **file** option.

**Syntax:** *size* to specify bytes, *sizek* to specify KB, *sizem* to specify MB, or *sizeg* to specify GB.

**Range:** 10,240 through 1,073,741,824 bytes

**Default:** 128 KB

**world-readable**—Enable any user to access the trace files.

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



## CHAPTER 4

# VXLAN Configuration Statements

- [vtep-source-interface on page 75](#)

### vtep-source-interface

---

<b>Syntax</b>	<code>vtep-source-interface;</code> <code>interface-name;</code> <code>(inet   inet6 );</code>
<b>Hierarchy Level</b>	<code>[edit switch-options]</code> <code>[edit routing-instances <i>routing-instance-name</i>]</code>
<b>Release Information</b>	Statement introduced in Junos OS Release 14.1X53-D10. Support at the <code>[edit routing-instances <i>routing-instance-name</i>]</code> hierarchy level introduced in Junos OS Release 17.3.
<b>Description</b>	Configure a source interface for a Virtual Extensible LAN (VXLAN) tunnel. You must provide the name of a logical interface configured on the loopback interface.
<b>Options</b>	<code>interface-name</code> —Loopback interface name.  <code>inet</code> —IPv4 source address.  <code>inet6</code> —IPv6 source address.
<b>Required Privilege Level</b>	<code>routing</code> —To view this statement in the configuration. <code>routing-control</code> —To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Understanding VXLANs on page 3</a></li><li>• <i>Manually Configuring VXLANs on QFX Series and EX4600 Switches</i></li><li>• <i>Examples: Manually Configuring VXLANs on QFX Series and EX4600 Switches</i></li></ul>



## CHAPTER 5

# Monitoring OVSDb

- `clear ovldb commit failures`
- `show ovldb commit failures`
- `show ovldb controller`
- `show ovldb interface`
- `show ovldb logical-switch`
- `show ovldb mac`
- `show ovldb statistics interface`
- `show ovldb virtual-tunnel-end-point`

## clear ovssdb commit failures

---

**Syntax**    `clear ovssdb commit failures`  
              `<transaction-id>`

**Release Information**    Command introduced in Junos OS Release 14.1X53-D26 for QFX Series switches.

**Description**    Remove a transaction from a queue maintained by a Juniper Networks switch that supports the Open vSwitch Database (OVSSDB) management protocol and Virtual Extensible LANs (VXLANs). The transaction includes OVSSDB-managed VXLANs and associated logical interfaces that the Juniper Networks switch dynamically configured and tried to commit but was unable to because of an issue with one or more of the configurations. In addition to removing the transaction, entering the **clear ovssdb commit failures** command causes the Juniper Networks switch to automatically retry committing all configurations in the transaction.

If there is an issue with one or more of the configurations in a transaction, this causes all configurations in the transaction, even the ones that are correctly configured, to remain uncommitted and in the queue until you troubleshoot and resolve the configuration issue(s).

You can display an erroneous transaction by entering the **show ovssdb commit failures** command. In the output that appears, you must determine which configuration(s) are erroneous and therefore prevent the Juniper Networks switch from committing the configurations in the transaction.

Issues that can cause commitment errors include but are not limited to the detection of the same VXLAN name or VXLAN network identifier (VNI) in a dynamically configured VXLAN and in a VXLAN that was previously configured using the Junos OS CLI.

To monitor for issues with dynamically configured OVSSDB-managed VXLANs and their associated interfaces, we recommend checking for system log messages and traceoptions files for OVSSDB.

After resolving the error(s), enter the **clear ovssdb commit failures** command to remove the transaction from the queue and retry committing all configurations in the transaction.



**NOTE:** While an erroneous transaction exists in the queue, the Juniper Networks switch cannot commit the dynamic configurations of additional VXLANs and their associated logical interfaces. The commitment of these VXLANs and logical interfaces remain in a pending state until all VXLAN and logical interface configurations in the erroneous transaction are resolved and successfully committed.

---

**Options**    **none**—Remove the transaction that currently appears in the **show ovssdb commit failures** command output, and retry committing all configurations in the transaction.

***transaction-id***—Remove the transaction with the specified numerical ID, and retry committing the configurations in the transaction.

**Required Privilege Level**      clear

**Related Documentation**      • [show ovssdb commit failures on page 80](#)

**List of Sample Output**      [clear ovssdb commit failures on page 79](#)  
                                     [clear ovssdb commit failures \(Specific Transaction\) on page 79](#)

## Sample Output

[clear ovssdb commit failures](#)

```
user@host> clear ovssdb commit failures
```

[clear ovssdb commit failures \(Specific Transaction\)](#)

```
user@host> clear ovssdb commit failures 1
```

## show ovssdb commit failures

---

**Syntax**    `show ovssdb commit failures`  
              `<transaction-id>`

**Release Information**    Command introduced in Junos OS Release 14.1X53-D26 for QFX Series switches.

**Description**    Display configurations of Open vSwitch Database (OVSSDB)-managed Virtual Extensible LANs (VXLANs) and associated logical interfaces that the Juniper Networks switch dynamically configured but was unable to commit.

For each OVSSDB-managed VXLAN and associated logical interface that you plan to implement in a Junos OS environment, you must configure equivalent entities in NSX Manager or in the NSX API for an NSX environment, or in the Contrail Web user interface for a Contrail environment. The software-defined networking (SDN) controller pushes these configurations to the connected Juniper Networks switch by way of the OVSSDB schema for physical devices. After the Juniper Networks switch receives these configurations, it dynamically configures a Junos OS-equivalent VXLAN and associated logical interface, and attempts to commit the configurations.

During the commitment of the dynamic configurations, If there is an issue with one or more of the configurations, all configurations in the transaction, even the ones that are correctly configured, remain uncommitted and are saved in a queue. All configurations in the transaction remain uncommitted and in the queue until you troubleshoot and resolve the configuration issues. After you resolve the configuration issues, you must use the [clear ovssdb commit failures](#) command to remove the transaction from the queue and retry committing the configurations.



**NOTE:** While an erroneous transaction exists in the queue, the Juniper Networks switch cannot commit the dynamic configurations of additional VXLANs and their associated logical interfaces. The commitment of these VXLANs and logical interfaces remain in a pending state until all VXLAN and logical interface configurations in the erroneous transaction are resolved and successfully committed.

---

Issues that can cause commitment errors include but are not limited to the detection of the same VXLAN name or VXLAN network identifier (VNI) in a dynamically configured VXLAN and in a VXLAN that was previously configured using the Junos OS CLI.

To monitor for issues with dynamically configured OVSSDB-managed VXLANs and their associated interfaces, we recommend checking for system log messages and traceoptions files for OVSSDB.

**Options**    **none**—Display information about an erroneous transaction.



**transaction-id**—Display information about the transaction with the specified numerical ID.

**Required Privilege Level** admin

**Related Documentation**

- [Understanding Dynamically Configured VXLANs in an OVSDb Environment on page 18](#)
- [traceoptions \(OVSDb\) on page 72](#)

**List of Sample Output** [show ovssdb commit failures on page 81](#)  
[show ovssdb commit failure \(Specific Transaction\) on page 81](#)

**Output Fields** [Table 15 on page 81](#) lists the output fields for the **show ovssdb commit failures** command. Output fields are listed in the approximate order in which they appear.

*Table 15: show ovssdb commit failures Output Fields*

Field Name	Field Description
Txn ID	ID assigned to a transaction by the Juniper Networks switch.
Logical-switch	Name of the VXLAN that the Juniper Networks switch dynamically configured but was unable to commit the configuration of.
Port	Name of an OVSDb-managed physical interface that is associated with the VXLAN.
VLAN ID	ID that is assigned to the VXLAN.

## Sample Output

### show ovssdb commit failures

```

user@host> show ovssdb commit failures
Txn ID      Logical-switch      Port      VLAN ID
1           28805c1d-0122-495d-85df-19abd647d772  xe-0/0/5:0  1016
1
1           9acc24b3-7b0a-4c2e-b572-3370c3e1acff  xe-0/0/5:0  1017
1
...

```

### show ovssdb commit failure (Specific Transaction)

```

user@host> how ovssdb commit failures 1
Txn ID      Logical-switch      Port      VLAN ID
1           28805c1d-0122-495d-85df-19abd647d772  xe-0/0/5:0  1016
1
1           9acc24b3-7b0a-4c2e-b572-3370c3e1acff  xe-0/0/5:0  1017
1
...

```

## show ovssdb controller

<b>Syntax</b>	<code>show ovssdb controller</code> <code>&lt;address ip-address&gt;</code>
<b>Release Information</b>	Command introduced in Junos OS Release 14.1R2. Command introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Command introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Display information and connection status for software-defined networking (SDN) controllers to which the Juniper Networks device is connected.
<b>Options</b>	<b>none</b> —Display information about all SDN controllers to which the Juniper Networks device is connected.  <b>address ip-address</b> —Display information about the SDN controller at the specified IP address.
<b>Required Privilege Level</b>	admin
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Setting Up the OVSSDB Protocol on Juniper Networks Devices that Support Manual Configuration of VXLANs</a></li> <li>• <a href="#">Setting Up OVSSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs on page 34</a></li> <li>• <a href="#">Understanding How to Set Up OVSSDB Connections on a Juniper Networks Device on page 15</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ovssdb controller on page 83</a> <a href="#">show ovssdb controller address on page 83</a>
<b>Output Fields</b>	<a href="#">Table 16 on page 82</a> lists the output fields for the <b>show ovssdb controller</b> command. Output fields are listed in the approximate order in which they appear.

**Table 16: show ovssdb controller Output Fields**

Field Name	Field Description
Controller IP address	IP address of the SDN controller to which the Juniper Networks device is connected.
Controller protocol	Protocol used by the Juniper Networks device to initiate the connection.
Controller port	Port to which the Juniper Networks device is connected.
Controller connection	State of the connection with the SDN controller.

Table 16: show ovssdb controller Output Fields (continued)

Field Name	Field Description
Controller seconds-since-connect	Number of seconds since the connection with the SDN controller was established.
Controller seconds-since-disconnect	Number of seconds since the connection with the SDN controller was dropped.
Controller connection status	Status of the connection with the SDN controller.

## Sample Output

### show ovssdb controller

```

user@host> show ovssdb controller
VTEP controller information:
Controller IP address: 10.168.66.189
Controller protocol: ssl
Controller port: 6632
Controller connection: up
Controller seconds-since-connect: 56290
Controller seconds-since-disconnect: 0
Controller connection status: active

Controller IP address: 10.168.181.54
Controller protocol: ssl
Controller port: 6632
Controller connection: up
Controller seconds-since-connect: 56292
Controller seconds-since-disconnect: 0
Controller connection status: active

Controller IP address: 10.168.182.45
Controller protocol: ssl
Controller port: 6632
Controller connection: up
Controller seconds-since-connect: 56292
Controller seconds-since-disconnect: 0
Controller connection status: active

```

### show ovssdb controller address

```

user@host> show ovssdb controller address 10.168.182.45
VTEP controller information:
Controller IP address: 10.168.182.45
Controller protocol: ssl
Controller port: 6632
Controller connection: up
Controller seconds-since-connect: 56347
Controller seconds-since-disconnect: 0
Controller connection status: active

```

## show ovssdb interface

<b>Syntax</b>	<code>show ovssdb interface</code> <code>&lt;interface-name&gt;</code>
<b>Release Information</b>	Command introduced in Junos OS Release 14.1R2. Command introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Command introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Display information about Open vSwitch Database (OVSSDB)-managed interfaces configured by using the <code>interfaces interface-name</code> statement in the <code>[edit protocols ovssdb]</code> hierarchy.
<b>Options</b>	<b>none</b> —Display information about all OVSSDB-managed interfaces.  <b>interface-name</b> —Display information about the specified OVSSDB-managed interface.
<b>Required Privilege Level</b>	admin
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">Setting Up the OVSSDB Protocol on Juniper Networks Devices that Support Manual Configuration of VXLANs</a></li> <li><a href="#">Setting Up OVSSDB on Juniper Networks Devices That Support the Dynamic Configuration of VXLANs on page 34</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ovssdb interface on page 85</a> <a href="#">show ovssdb (Specific Interface) on page 85</a>
<b>Output Fields</b>	<a href="#">Table 17 on page 84</a> lists the output fields for the <code>show ovssdb interface</code> command. Output fields are listed in the approximate order in which they appear.

Table 17: show ovssdb interface Output Fields

Field Name	Field Description
Interface	Name of interface.
VLAN ID	ID of Virtual Extensible LAN (VXLAN) with which the interface is associated.  <b>NOTE:</b> This field is not supported by MX Series routers or EX9200 switches.
Bridge domain or VLAN	Bridge domain or VLAN under which the VXLAN is created.  <b>NOTE:</b> This field is not supported by MX Series routers or EX9200 switches.

## Sample Output

### show ovssdb interface

```
user@host> show ovssdb interface
Interface          VLAN ID          Bridge-domain
ge-7/0/9.0
ge-7/0/9.1
irb.11
irb.12
irb.2
irb.3
xe-10/3/0.0
xe-10/3/0.1
```

### show ovssdb (Specific Interface)

```
user@host> show ovssdb interface ge-7/0/9.0
Interface          VLAN ID          Bridge-domain
ge-7/0/9.0
```

## show ovssdb logical-switch

**Syntax** `show ovssdb logical-switch  
<logical-switch-name>`

**Release Information** Command introduced in Junos OS Release 14.1R2.  
Command introduced in Junos OS Release 14.1X53-D10 for QFX Series switches.  
Command introduced in Junos OS Release 14.2 for EX Series switches.

**Description**



**NOTE:** In the Open vSwitch Database (OVSDb) schema for physical devices, the logical switch table stores information about the Layer 2 broadcast domain that you configured in a VMware NSX or Contrail environment. In the NSX environment, the Layer 2 broadcast domain is known as a *logical switch*, while in the Contrail environment, the domain is known as a *virtual network*.

In the context of the `show ovssdb logical-switch` command, the term *logical switch* refers to the logical switch or virtual network that was configured in the NSX or Contrail environments, respectively, and the corresponding configuration that was pushed to the OVSDb schema.

Display information about logical switches and the corresponding Virtual Extensible LANs (VXLANs), which were configured on the Juniper Networks device.

In the command output, each logical switch is identified by a universally unique identifier (UUID), which in the context of this command, is also known as a logical switch name.

The `show ovssdb logical-switch` command displays the state of the logical switch (**Flags**), which can be one of the following:

**Created by Controller**—A logical switch is configured. However, a corresponding VXLAN is not yet configured. In this state, the logical switch and corresponding VXLAN are not yet operational.

**Created by L2ALD**—A VXLAN is configured. However, a corresponding logical switch is not yet configured. In this state, the logical switch and corresponding VXLAN are not yet operational.

**Created by both**—A logical switch and a corresponding VXLAN are configured. In this state, the logical switch and corresponding VXLAN are operational.

**Tunnel key mismatch**—The VNIs specified in the logical switch and corresponding VXLAN configurations do not match. In this state, the logical switch and corresponding VXLAN are not yet operational.

**Options** **none**—Display information about all logical switches that are present in the OVSDb schema for physical devices.

**logical-switch-name**—Display information about the specified logical switch.

**Required Privilege Level** admin

**Related Documentation**

- [OVSDb Schema for Physical Devices on page 25](#)
- [Troubleshooting a Nonoperational Logical Switch and Corresponding Junos OS OVSDb-Managed VXLAN on page 58](#)

**List of Sample Output** [show ovssdb logical-switch on page 87](#)  
[show ovssdb logical-switch \(Specific Logical Switch\) on page 88](#)

**Output Fields** [Table 18 on page 87](#) lists the output fields for the **show ovssdb logical-switch** command. Output fields are listed in the approximate order in which they appear.

*Table 18: show ovssdb logical-switch Output Fields*

Field Name	Field Description
Logical Switch Name	UUID that is automatically generated and assigned to the logical switch. When you configure the corresponding VXLAN in the Junos OS CLI, you must specify the same UUID as the VXLAN name.
Flags	State of the logical switch. For possible states, see the Description section of this topic.
VNI	VNI that is configured for the logical switch and corresponding VXLAN.
Num of Remote MAC	The total number of remote media access control (MAC) addresses associated with the logical switch. These addresses are learned by software and hardware virtual tunnel endpoints (VTEPs).
Num of Local MAC	The total number of local MAC addresses associated with the logical switch. <i>Local MAC addresses</i> are addresses learned on the local physical ports.

## Sample Output

### show ovssdb logical-switch

```
user@host> show ovssdb logical-switch
Logical switch information:
Logical Switch Name: 24a76aff-7e61-4520-a78d-3eca26ad7510
Flags: Created by both
VNI: 3
Num of Remote MAC: 13
Num of Local MAC: 12
Logical Switch Name: 9b4f880e-dac8-4612-a832-97ad9dec270f
Flags: Created by Controller
VNI: 50
Num of Remote MAC: 0
Num of Local MAC: 0
Logical Switch Name: bc0da2da-6c16-44bf-b655-442484294ded
Flags: Created by Controller
```

```
VNI: 51
Num of Remote MAC: 0
Num of Local MAC: 0
```

#### show ovssdb logical-switch (Specific Logical Switch)

```
user@host> show ovssdb logical-switch 24a76aff-7e61-4520-a78d-3eca26ad7510
Logical switch information:
Logical Switch Name: 24a76aff-7e61-4520-a78d-3eca26ad7510
Flags: Created by both
VNI: 3
Num of Remote MAC: 13
Num of Local MAC: 12
```



## show ovssdb mac

---

**Syntax**    `show ovssdb mac`  
               `<address mac-address>`  
               `<local>`  
               `<logical-switch logical-switch-uuid>`  
               `<multicast>`  
               `<remote>`  
               `<unicast>`

**Release Information**    Command introduced in Junos OS Release 14.1R2.  
                               Command introduced in Junos OS Release 14.1X53-D10 for QFX Series switches.  
                               Command introduced in Junos OS Release 14.2 for EX Series switches.

**Description**    Display media access control (MAC) addresses, as well as information about the MAC addresses, learned by a Juniper Networks device that functions as a hardware virtual tunnel endpoint (VTEP). Using the Open vSwitch Database (OVSDB) management protocol, this hardware VTEP can learn about MAC addresses directly or from other software or hardware VTEPs. The MAC addresses learned directly by the hardware VTEP are known as *local addresses*, while the addresses learned from other software or hardware VTEPs are known as *remote addresses*.

**Options**    Use one or more of the following options to display a more specific list of MAC addresses and information about the MAC addresses. For example, to display a list of local unicast MAC addresses, you can issue the **show ovssdb mac local unicast** command.

**none**—Display all MAC addresses, which includes all local, remote, unicast, and multicast addresses associated with all logical switches.

**address *mac-address***—Display the specified MAC address.

**count**—(All Juniper Networks devices that support OVSDB except EX9200 switches)  
           Display the number of MAC addresses learned by the Juniper Networks device. Using this option alone, the number includes all local, remote, unicast, and multicast MAC addresses associated with all logical switches in the logical switch table of the OVSDB schema for physical devices. You can use this option with one or more of the other options to display a more specific count of MAC addresses. For example, to display the number of local and remote unicast MAC addresses, you can issue the **show ovssdb mac count local remote unicast** command.

**local**—Display all local MAC addresses.

**logical-switch *logical-switch-uuid***—Display all MAC addresses associated with the specified logical switch in the logical switch table of the OVSDB schema for physical devices.

**multicast**—Display all multicast MAC addresses.

**remote**—Display all remote MAC addresses.

**unicast**—Display all unicast MAC addresses.

**Required Privilege Level** admin

**Related Documentation**

- [OVSDB Schema for Physical Devices on page 25](#)

**List of Sample Output**

- [show ovssdb mac on page 90](#)
- [show ovssdb mac address on page 91](#)
- [show ovssdb mac logical-switch on page 91](#)
- [show ovssdb mac local unicast on page 92](#)
- [show ovssdb mac \(Count of All Local, Remote, Unicast, and Multicast MAC Addresses for All Logical Switches\) on page 92](#)

**Output Fields** Table 19 on page 90 lists the output fields for the **show ovssdb mac** command. Output fields are listed in the approximate order in which they appear.

*Table 19: show ovssdb mac Output Fields*

Field Name	Field Description
Logical Switch Name	Universally unique identifier (UUID) of the logical switch.
MAC Address	MAC addresses of virtual machines (VMs).
IP Address	IP address of VMs.  <b>NOTE:</b> If the IP addresses of VMs are not published by the SDN controller, this field displays 0.0.0.0.
Encapsulation	Encapsulation type.
VTEP Address	IP address of the hardware or software VTEP from which the MAC address was learned. Further, this VTEP can forward VM traffic to the associated host.
MAC Count	<b>NOTE:</b> This field is supported by all Juniper Networks devices that support OVSDb except EX9200 switches.  Number of all or specified MAC addresses learned by the Juniper Networks device.

## Sample Output

### show ovssdb mac

```

user@host> show ovssdb mac
Logical Switch Name: 24a76aff-7e61-4520-a78d-3eca26ad7510
  Mac          IP          Encapsulation    Vtep
  Address      Address
02:00:00:00:03:01  0.0.0.0    Vxlan over Ipv4   10.255.18.22
02:00:00:00:03:02  0.0.0.0    Vxlan over Ipv4   10.255.18.22
02:00:00:00:03:03  0.0.0.0    Vxlan over Ipv4   10.255.18.22

```

02:00:00:00:03:04	0.0.0.0	Vxlan over Ipv4	10.255.18.22
02:00:00:00:03:05	0.0.0.0	Vxlan over Ipv4	10.255.18.22
04:00:00:00:03:05	0.0.0.0	Vxlan over Ipv4	10.255.18.22
06:00:00:00:03:01	0.0.0.0	Vxlan over Ipv4	10.255.18.22
06:00:00:00:03:02	0.0.0.0	Vxlan over Ipv4	10.255.18.22
06:00:00:00:03:03	0.0.0.0	Vxlan over Ipv4	10.255.18.22
06:00:00:00:03:04	0.0.0.0	Vxlan over Ipv4	10.255.18.22
06:00:00:00:03:05	0.0.0.0	Vxlan over Ipv4	10.255.18.22
40:b4:f0:06:6f:f0	0.0.0.0	Vxlan over Ipv4	10.255.18.22
ff:ff:ff:ff:ff:ff	0.0.0.0	Vxlan over Ipv4	10.100.100.1

Logical Switch Name: bf6d4fd4-f5f6-430c-8c37-4033ef1c55ab

Mac Address	IP Address	Encapsulation	Vtep Address
02:00:00:00:11:01	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:02	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:03	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:04	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.1.1.29
04:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:01	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:02	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:03	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:04	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.1.1.29
40:b4:f0:06:6f:f0	0.0.0.0	Vxlan over Ipv4	10.1.1.29
00:23:9c:5e:a7:f0	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:01	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:02	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:03	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:04	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.255.18.22
ff:ff:ff:ff:ff:ff	0.0.0.0	Vxlan over Ipv4	10.110.110.1

...

### show ovssdb mac address

user@host> show ovssdb mac address 02:00:00:00:03:01

Mac Address	IP Address	Encapsulation	Vtep Address
02:00:00:00:03:01	0.0.0.0	Vxlan over Ipv4	10.255.18.22

### show ovssdb mac logical-switch

user@host> show ovssdb mac logical-switch bf6d4fd4-f5f6-430c-8c37-4033ef1c55ab

Logical Switch Name: bf6d4fd4-f5f6-430c-8c37-4033ef1c55ab

Mac Address	IP Address	Encapsulation	Vtep Address
02:00:00:00:11:01	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:02	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:03	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:04	0.0.0.0	Vxlan over Ipv4	10.1.1.29
02:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.1.1.29
04:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:01	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:02	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:03	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:04	0.0.0.0	Vxlan over Ipv4	10.1.1.29
06:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.1.1.29

40:b4:f0:06:6f:f0	0.0.0.0	Vxlan over Ipv4	10.1.1.29
00:23:9c:5e:a7:f0	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:01	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:02	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:03	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:04	0.0.0.0	Vxlan over Ipv4	10.255.18.22
08:00:00:00:11:05	0.0.0.0	Vxlan over Ipv4	10.255.18.22
ff:ff:ff:ff:ff:ff	0.0.0.0	Vxlan over Ipv4	10.110.110.1

### show ovssdb mac local unicast

```
user@host> show ovssdb mac local unicast
```

```
Logical Switch Name: 24a76aff-7e61-4520-a78d-3eca26ad7510
```

Mac Address	IP Address	Encapsulation	Vtep Address
02:00:00:00:03:01	0.0.0.0	Vxlan over Ipv4	10.255.181.72
02:00:00:00:03:02	0.0.0.0	Vxlan over Ipv4	10.255.181.72
02:00:00:00:03:03	0.0.0.0	Vxlan over Ipv4	10.255.181.72
02:00:00:00:03:04	0.0.0.0	Vxlan over Ipv4	10.255.181.72
02:00:00:00:03:05	0.0.0.0	Vxlan over Ipv4	10.255.181.72
04:00:00:00:03:05	0.0.0.0	Vxlan over Ipv4	10.255.181.72
06:00:00:00:03:01	0.0.0.0	Vxlan over Ipv4	10.255.181.72
06:00:00:00:03:02	0.0.0.0	Vxlan over Ipv4	10.255.181.72
06:00:00:00:03:03	0.0.0.0	Vxlan over Ipv4	10.255.181.72
06:00:00:00:03:04	0.0.0.0	Vxlan over Ipv4	10.255.181.72
06:00:00:00:03:05	0.0.0.0	Vxlan over Ipv4	10.255.181.72
40:b4:f0:06:6f:f0	0.0.0.0	Vxlan over Ipv4	10.255.181.72

...

### show ovssdb mac (Count of All Local, Remote, Unicast, and Multicast MAC Addresses for All Logical Switches)

```
user@host> show ovssdb mac count
```

```
MAC count: 6877
```

## show ovssdb statistics interface

<b>Syntax</b>	<code>show ovssdb statistics interface</code> <code>&lt;interface-name&gt;</code>
<b>Release Information</b>	Command introduced in Junos OS Release 14.1R2. Command introduced in Junos OS Release 14.1X53-D10 for QFX Series switches. Command introduced in Junos OS Release 14.2 for EX Series switches.
<b>Description</b>	Display statistics for Open vSwitch Database (OVSSDB)-managed interfaces configured by using the <code>interfaces interface-name</code> statement in the <code>[edit protocols ovssdb]</code> hierarchy.  When an interface is configured as OVSSDB-managed, the collection of statistics for that interface begins, and the statistics displayed at any given time reflects the data collected up to that point.
<b>Options</b>	<b>none</b> —Display statistics for all configured OVSSDB-managed interfaces.  <b>interface-name</b> —Display statistics for the specified interface.
<b>Required Privilege Level</b>	admin
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">interfaces on page 66</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ovssdb statistics interface on page 94</a> <a href="#">show ovssdb statistics interface (Specific Interface) on page 94</a>
<b>Output Fields</b>	<a href="#">Table 20 on page 93</a> lists the output fields for the <code>show ovssdb statistics interface</code> command. Output fields are listed in the approximate order in which they appear.

*Table 20: show ovssdb statistics interface Output Fields*

Field Name	Field Description
Num of rx pkts	Number of packets received by the interface.
Num of tx pkts	Number of packets sent by the interface.
Num of rx bytes	Number of bytes received by the interface.
Num of tx bytes	Number of bytes sent by the interface.

## Sample Output

### show ovssdb statistics interface

```
user@host> show ovssdb statistics interface
Interface Name: ge-7/0/9.0
Num of rx pkts: 945                               Num of tx pkts: 113280890
Num of rx bytes: 56700                             Num of tx bytes: 57531319540
Interface Name: ge-7/0/10.0
Num of rx pkts: 459                               Num of tx pkts: 473840856
Num of rx bytes: 84747                             Num of tx bytes: 45830738532
Interface Name: ge-7/0/11.0
Num of rx pkts: 305                               Num of tx pkts: 367483456
Num of rx bytes: 98974                             Num of tx bytes: 33495468092
```

### show ovssdb statistics interface (Specific Interface)

```
user@host> show ovssdb statistics interface ge-7/0/9.0
Interface Name: ge-7/0/9.0
Num of rx pkts: 945                               Num of tx pkts: 113280890
Num of rx bytes: 56700                             Num of tx bytes: 57531319540
```

## show ovssdb virtual-tunnel-end-point

<b>Syntax</b>	<pre>show ovssdb virtual-tunnel-end-point address &lt;ip-address&gt; encapsulation &lt;encapsulation-type&gt;</pre>
<b>Release Information</b>	<p>Command introduced in Junos OS Release 14.1R2.</p> <p>Command introduced in Junos OS Release 14.1X53-D10 for QFX Series switches.</p> <p>Command introduced in Junos OS Release 14.2 for EX Series switches.</p>
<b>Description</b>	<p>Display information about the following entities that the Juniper Networks device has learned:</p> <ul style="list-style-type: none"> <li>• Other Juniper Networks devices that function as hardware virtual tunnel endpoints (VTEPs)</li> <li>• Software VTEPs</li> <li>• Service nodes</li> <li>• Top-of-rack service nodes (TSNs)</li> </ul>
<b>Options</b>	<p><b>none</b>—Display information about all VTEPs, service nodes, and TSNs that the Juniper Networks device has learned.</p> <p><b>address <i>ip-address</i></b>—Display information about the entity with the specified IP address.</p> <p><b>encapsulation <i>encapsulation-type</i></b>—Display information about all entities with the specified encapsulation type.</p>
<b>Required Privilege Level</b>	admin
<b>List of Sample Output</b>	<p><a href="#">show ovssdb virtual-tunnel-end-point on page 96</a></p> <p><a href="#">show ovssdb virtual-tunnel-end-point address (Specific Address) on page 96</a></p> <p><a href="#">show ovssdb virtual-tunnel-end-point encapsulation (Specific Encapsulation) on page 96</a></p> <p><a href="#">show ovssdb virtual-tunnel-end-point address (Specific Address) encapsulation (Specific Encapsulation) on page 96</a></p>
<b>Output Fields</b>	<p>Table 21 on page 95 lists the output fields for the <b>show ovssdb virtual-tunnel-end-point</b> command. Output fields are listed in the approximate order in which they appear.</p>

Table 21: show ovssdb virtual-tunnel-end-point Output Fields

Field Name	Field Description
Encapsulation	Encapsulation type of entity.
IP Address	IP address of entity.

Table 21: show ovssdb virtual-tunnel-end-point Output Fields (continued)

Field Name	Field Description
Num of MACs	Number of media access control (MAC) addresses learned by the entity.

## Sample Output

### show ovssdb virtual-tunnel-end-point

```

user@host> show ovssdb virtual-tunnel-end-point
Encapsulation      Ip Address      Num of MAC's
VXLAN over IPv4    10.255.181.43   24
VXLAN over IPv4    10.255.181.50   12
VXLAN over IPv4    10.255.181.72   24

```

### show ovssdb virtual-tunnel-end-point address (Specific Address)

```

user@host> show ovssdb virtual-tunnel-end-point address 10.255.181.43
Encapsulation      Ip Address      Num of MAC's
VXLAN over IPv4    10.255.181.43   24

```

### show ovssdb virtual-tunnel-end-point encapsulation (Specific Encapsulation)

```

user@host> show ovssdb virtual-tunnel-end-point encapsulation vxlan-over-ipv4
Encapsulation      Ip Address      Num of MAC's
VXLAN over IPv4    10.255.181.43   24
VXLAN over IPv4    10.255.181.50   12
VXLAN over IPv4    10.255.181.72   24

```

### show ovssdb virtual-tunnel-end-point address (Specific Address) encapsulation (Specific Encapsulation)

```

user@host> show ovssdb virtual-tunnel-end-point address 10.255.181.43 encapsulation
vxlan-over-ipv4
Encapsulation      Ip Address      Num of MAC's
VXLAN over IPv4    10.255.181.43   24

```



## CHAPTER 6

# Monitoring VXLAN

- [Monitoring a Remote VTEP Interface on page 97](#)
- [Understanding Overlay ping and traceroute Packet Support on page 98](#)
- [Example: Troubleshooting a VXLAN Overlay Network By Using Overlay Ping and Traceroute on QFX Series Switches on page 101](#)
- [ping overlay](#)
- [show bridge mac-table](#)
- [show vpls mac-table](#)
- [traceroute overlay](#)
- [Verifying VXLAN Reachability on page 134](#)
- [Verifying That a Local VXLAN VTEP Is Configured Correctly on page 134](#)
- [Verifying MAC Learning from a Remote VTEP on page 134](#)

### Monitoring a Remote VTEP Interface

---

**Purpose** Monitor traffic details for a remote VTEP interface.

**Action** user@switch> show interface *logical-name* detail

```

M   Flags: Up SNMP-Traps Encapsulation: ENET2
      VXLAN Endpoint Type: Remote, VXLAN Endpoint Address: 10.1.1.2, L2 Routing
Instance: default-switch, L3 Routing Instance: default
      Traffic statistics:
        Input bytes :          228851738624
        Output bytes :              0
        Input packets:          714162415
        Output packets:           0
      Local statistics:
        Input bytes :              0
        Output bytes :              0
        Input packets:             0
        Output packets:            0
      Transit statistics:
        Input bytes :          228851738624          0 bps
        Output bytes :              0              0 bps
        Input packets:          714162415          0 pps
        Output packets:           0              0 pps
      Protocol eth-switch, MTU: 1600, Generation: 277, Route table: 5

```

**Meaning** The output shows traffic details for the remote VTEP interface. To get this information, you must supply the logical name of the remote VTEP interface (vtep.12345 in the above output), which you can learn by using the **show ethernet-switching table** command.

- Related Documentation**
- [Understanding VXLANs on page 3](#)
  - *Manually Configuring VXLANs on QFX Series and EX4600 Switches*
  - *Examples: Manually Configuring VXLANs on QFX Series and EX4600 Switches*

## Understanding Overlay ping and traceroute Packet Support

In a virtualized overlay network, existing ping and traceroute mechanisms do not provide enough information to determine whether or not connectivity is established throughout the network. The existing **ping** and **traceroute** commands can only verify the basic connectivity between two endpoints in the underlying physical network, but not in the overlay network. For example, you can issue the existing **ping** command on a Juniper Networks device that functions as a virtual tunnel endpoint (VTEP) to another Juniper Networks devices that also functions as a VTEP in a Virtual Extensible LAN (VXLAN) overlay. In this situation, the ping output might indicate that the connection between the source and destination VTEPs is up and running despite the fact that one of the endpoints (physical servers upon which applications directly run) is not reachable.

Starting with Junos OS Release 14.1X53-D30 for QFX5100 switches, Release 16.1 for EX9200 switches, and Release 16.2 for MX Series routers, overlay ping and traceroute are introduced as troubleshooting tools for overlay networks.

For ping and traceroute mechanisms to work in overlay networks, the ping and traceroute packets, also referred to collectively as Operations, Administration, and Management

(OAM) packets, must be encapsulated with the same VXLAN UDP headers (outer headers) as the data packets forwarded over the overlay segment. This implementation ensures that transit nodes forward the OAM packets in the same way as a data packet for that particular overlay segment.

If any connectivity issues arise for a particular data flow, the overlay OAM packet corresponding to the flow would experience the same connectivity issues as the data packet for that flow.

When using ping overlay and traceroute overlay, keep the following in mind:

- The only tunnel type supported is VXLAN tunnels.
- The VTEPs in the overlay network that send and receive the overlay ping packets must be Juniper Networks devices that support overlay ping and traceroute.
- [Overlay ping and traceroute Functionality on page 99](#)
- [Overlay OAM Packet Format for UDP Payloads on page 99](#)

## Overlay ping and traceroute Functionality

Overlay ping and traceroute packets are sent as User Datagram Protocol (UDP) echo requests and replies and are encapsulated in the VXLAN header. VTEPs, which initiate and terminate overlay tunnels, send and receive overlay OAM packets. Overlay ping and traceroute are supported only in VXLAN overlay networks in which the sending and receiving VTEPs are both Juniper Networks devices.

The overlay ping functionality validates both the data plane and the MAC address and IP address of the VTEPs. This additional validation is different from the more commonly known IP ping functionality where the actual destination replies to the echo request without the overlay segment context.

While tracing a route in a VXLAN overlay network, Juniper Networks devices that are along the route that support overlay traceroute additionally provide a timestamp. Third-party devices and Juniper Networks devices that do not support overlay traceroute do not provide this timestamp.

## Overlay OAM Packet Format for UDP Payloads

The format of overlay OAM packets depends on the type of payload that is carried in the tunnel. In the case of VXLAN tunnels, the inner packet is a Layer 2 packet.



**NOTE:** Only Layer 2 UDP payloads are supported.

[Figure 4 on page 99](#) shows complete headers on a VXLAN-encapsulated overlay OAM packet.

*Figure 4: VXLAN-Encapsulated Overlay OAM Packet*



- Outer Ethernet header—Contains the source MAC (SMAC) and destination MAC (DMAC) addresses of directly connected nodes in the physical network. These addresses change at every hop.
- Outer IP header—Contains the source and destination IP addresses of the Juniper Networks devices that function as the VTEPs that initiate and terminate the tunnel.
- Outer UDP header—Contains the source port associated with the flow entropy and destination port. The source port is an internally calculated hash value. The destination port is the standard UDP port (4789) used for VXLAN.
- VXLAN header—Contains the VXLAN Network Identifier (VNI) or the segment ID of the VXLAN, and new router alert (RA) flag bits.
- Inner Ethernet header—Contains a control MAC address (00-00-5E-90-xx-xx) for both the SMAC and DMAC. This address is not forwarded out of the VTEP. Alternatively, the SMAC can be set to a non-control MAC address. However, if a non-control MAC address is used, the VTEP must not learn the SMAC from the overlay OAM packets.
- Inner IP header—Contains the source IP address that can be set to the IP address of the endpoint or source VTEP. The destination IP address can be set to the 127/8 address, which ensures that the overlay OAM packet is not forwarded out of the ports of the Juniper Networks device that is configured as a VTEP.
- Inner UDP header—Contains a new reserved value used in the destination port field in the inner UDP header. This value identifies the incoming UDP packet as an overlay OAM packet.
- Inner UDP payload—Contains all of the overlay OAM-specific message format and type, length, and value (TLV) definitions.

The Inner UDP payload format is as follows:

0										1										2										3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
Message Type										Reply mode										Return Code										Return Subcode											
Originator Handle																																									
Sequence Number																																									
TimeStamp Sent (seconds)																																									
TimeStamp Sent (microseconds)																																									
TimeStamp Received (seconds)																																									
TimeStamp Received (microseconds)																																									
TLVs ...																																									
.																																									
.																																									
.																																									

The OAM-specific message type is one of the following:

Value What it means

```
-----
1      Echo Request
2      Echo Reply
```

Reply Mode Values:-

Value What it means

```
-----
1      Do not reply
2      Reply via an IPv4/IPv6 UDP Packet
3      Reply via Overlay Segment
```

The TLV definition for VXLAN ping is as follows:

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Type = 1(VXLAN ping IPv4) | Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| VXLAN VNI | Reserved |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| IPv4 Sender Address |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

#### Release History Table

Release	Description
14.1X53-D30	Starting with Junos OS Release 14.1X53-D30 for QFX5100 switches, Release 16.1 for EX9200 switches, and Release 16.2 for MX Series routers, overlay ping and traceroute are introduced as troubleshooting tools for overlay networks.

#### Related Documentation

- [Example: Troubleshooting a VXLAN Overlay Network By Using Overlay Ping and Traceroute on QFX Series Switches on page 101](#)
- [ping overlay on page 114](#)
- [traceroute overlay on page 130](#)

## Example: Troubleshooting a VXLAN Overlay Network By Using Overlay Ping and Traceroute on QFX Series Switches

In a Virtual Extensible LAN (VXLAN) overlay network, the existing **ping** and **traceroute** commands can verify the basic connectivity between two Juniper Networks devices that function as virtual tunnel endpoints (VTEPs) in the underlying physical network. However, in between the two VTEPs, there could be multiple routes through intermediary devices to the same destinations, and the ping and traceroute packets might successfully reach their destinations, while a connectivity issue exists in another route along which the data packets are typically forwarded.

With the introduction of the **overlay** parameter and other options in Junos OS Release 14.1X53-D30 for QFX5100 switches, you can use the **ping** and **traceroute** commands to troubleshoot a VXLAN overlay network.

For ping and traceroute mechanisms to work in a VXLAN overlay network, the ping and traceroute packets, also referred to as Operations, Administration, and Management (OAM) packets, must be encapsulated with the same VXLAN UDP headers (outer headers) as the data packets forwarded over the VXLAN segment with possible connectivity issues. If any connectivity issues arise, the overlay OAM packet would experience the same issues as the data packet.

This example shows how to use overlay ping and traceroute on a VTEP to verify the following in a VXLAN overlay network:

- Scenario 1—Verify that a particular VXLAN is configured on another VTEP.
- Scenario 2—Verify that the MAC address of a particular endpoint is associated with a VXLAN on another VTEP.
- Scenario 3—Verify that no issues exist in a particular data flow between sending and receiving endpoints.



**NOTE:** When issuing the `ping overlay` and `traceroute overlay` commands, the source VTEP on which you issue the command and the destination VTEP that receives the ping or traceroute packet must be Juniper Networks devices that support overlay ping and traceroute.

## Requirements

This example uses the following hardware and software components:

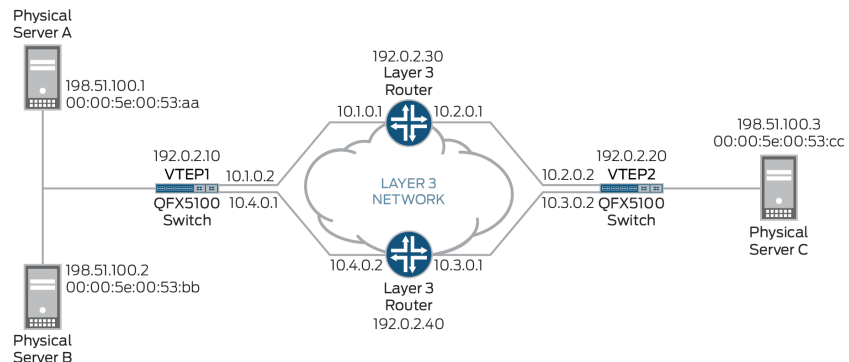
- Three physical (bare-metal) servers on which applications directly run.
- Two QFX5100 switches running Junos OS Release 14.1X53-D30 or later software. These switches function as VTEPs.
- Two Layer 3 routers, which can be Juniper Networks routers or routers provided by another vendor.

Before issuing the `ping overlay` and `traceroute overlay` commands, gather the information needed for each parameter—for example, IP addresses or MAC addresses—used for a particular scenario. See [Table 22 on page 103](#) to determine which parameters are used for each scenario.

## Overview and Topology

The VXLAN overlay network topology shown in [Figure 5 on page 103](#) includes physical servers A, B, and C on which applications directly run. The applications on physical servers A and B need to communicate with the applications on physical server C. These servers are on the same subnet, so the communication between the applications occurs at the Layer 2 level, and VXLAN encapsulation or tunnels are used to transport their data packets over a Layer 3 network.

Figure 5: Using Overlay Ping and Traceroute to Troubleshoot a VXLAN Overlay Network



In this topology, there are two QFX5100 switches that function as VTEPs. VTEP1 initiates and terminates VXLAN tunnels for physical servers A and B, and VTEP2 does the same for physical server C. VTEP1 and VTEP2 are in VXLAN 100.

A data packet sent from physical server A is typically routed to the Layer 3 router with the IP address of 192.0.2.30 to reach physical server C.

In this VXLAN overlay network topology, a communication issue arises between physical servers A and C. To troubleshoot the issue with this data flow, you can initiate the **ping overlay** and **traceroute overlay** commands on VTEP1 (the source VTEP or **tunnel-src**) and specify that VTEP2 is the destination VTEP or **tunnel-dst**.

The **ping overlay** and **traceroute overlay** commands include several parameters. [Table 22 on page 103](#) explains the purpose and provides a value for each of the parameters used in scenarios 1, 2, and 3.

[Table 22 on page 103](#) does not include all available **ping overlay** and **traceroute overlay** parameters. This example uses the default values of these omitted parameters.

Table 22: Ping and Traceroute Overlay Parameter Values For Scenarios 1, 2, and 3

ping overlay and traceroute overlay Parameters	Description	Scenario to Which Parameter Applies	Value
<b>tunnel-type</b>	Identifies type of tunnel that you are troubleshooting.	All	vxlan
<b>vni</b>	VXLAN network identifier (VNI) of VXLAN used in this example.	All	100
<b>tunnel-src</b>	IP address of VTEP1, on which you initiate overlay ping or traceroute.	All	192.0.2.10
<b>tunnel-dst</b>	IP address of VTEP2, which receives the overlay ping or traceroute packets.	All	192.0.2.20

Table 22: Ping and Traceroute Overlay Parameter Values For Scenarios 1, 2, and 3 (continued)

ping overlay and traceroute overlay Parameters	Description	Scenario to Which Parameter Applies	Value
<b>mac</b>	MAC address of physical server C, which is the destination endpoint.	Scenarios 2 and 3 only	00:00:5E:00:53:cc
<b>count</b>	Number of overlay ping requests that VTEP1 sends.  <b>NOTE:</b> The count parameter does not apply to overlay traceroute.	All	5
<b>hash-source-mac</b>	MAC address of physical server A, which is the source endpoint.	Scenario 3 only	00:00:5E:00:53:aa
<b>hash-destination-mac</b>	MAC address of physical server C, which is the destination endpoint.  <b>NOTE:</b> When specifying this parameter for scenario 3, the MAC address must be the same MAC address as specified for the <b>mac</b> parameter.	Scenario 3 only	00:00:5E:00:53:cc
<b>hash-source-address</b>	IP address of physical server A.	Scenario 3 only	198.51.100.1
<b>hash-destination-address</b>	IP address of physical server C.	Scenario 3 only	198.51.100.3
<b>hash-vlan</b>	VLAN ID of source endpoint.  <b>NOTE:</b> If the source endpoint is not a member of a VLAN, you do not need to use this parameter.	Scenario 3 only	150
<b>hash-input-interface</b>	VTEP1 interface on which data flow originates.	Scenario 3 only	xe-0/0/2
<b>hash-protocol</b>	A value for the protocol used in the data flow.	Scenario 3 only	17
<b>hash-source-port</b>	A value for the outer TCP/UDP source port.	Scenario 3 only	4456
<b>hash-destination-port</b>	A value for the outer UDP destination port.	Scenario 3 only	4540



Table 22 on page 103 includes several hash parameters, which are used for scenario 3. For each of these parameters, you must specify a value associated with the data flow that you are troubleshooting. Based on the values that you specify, the system calculates a VXLAN UDP header source port hash, which is included in the VXLAN UDP header of the overlay ping and traceroute packets. Including the calculated hash in the VXLAN UDP header enables the overlay ping and traceroute packets to emulate data packets in the flow that you are troubleshooting.



**BEST PRACTICE:** When using the hash parameters, we recommend that you specify a value for each parameter. The exception to this guideline is the hash-vlan parameter, which you do not have to use if the source endpoint is not a member of a VLAN. This practice ensures that the overlay ping and traceroute processes are successful and that the output for each command is accurate. If you do not specify a value for one or more of the hash parameters, the system sends an OAM request that might include incorrect hash values and generates a warning message.

## Verification

This section includes the following verification tasks:

- [Scenario 1: Verifying That VXLAN 100 Is Configured on VTEP2 on page 105](#)
- [Scenario 2: Verifying That the MAC Address of the Destination Endpoint Is on VTEP2 on page 108](#)
- [Scenario 3: Verifying a Data Flow on page 110](#)

### Scenario 1: Verifying That VXLAN 100 Is Configured on VTEP2

**Purpose** Verify that a VXLAN with the VNI of 100 is configured on VTEP2. You can use either overlay ping or traceroute to perform this verification.

#### Overlay Ping Action

On VTEP1, initiate an overlay ping:

```
user@switch> ping overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst 192.0.2.20
count 5
ping-overlay protocol vxlan
```

```
vni 100
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:00:00:00:00
count 5
ttl 255
```

```
WARNING: following hash-parameters are missing -
        hash computation may not succeed
```

```
end-host smac
```

```
end-host dmac
end-host src ip
end-host dst ip
end-host vlan
end-host input interface
end-host protocol
end-host 14-src-port
end-host 14-dst-port
```

Request for seq 1, to 192.0.2.20, at 09-24 22:03:16 PDT.033 msecs

Response for seq 1, from 192.0.2.20, at 09-24 22:03:16 PDT.036 msecs, rtt 10 msecs

Overlay-segment not present at RVTEP 192.0.2.20

Request for seq 2, to 192.0.2.20, at 09-24 22:03:16 PDT.044 msecs

Response for seq 2, from 192.0.2.20, at 09-24 22:03:16 PDT.046 msecs, rtt 10 msecs

Overlay-segment not present at RVTEP 192.0.2.20

Request for seq 3, to 192.0.2.20, at 09-24 22:03:16 PDT.054 msecs

Response for seq 3, from 192.0.2.20, at 09-24 22:03:16 PDT.057 msecs, rtt 10 msecs

Overlay-segment not present at RVTEP 192.0.2.20

Request for seq 4, to 192.0.2.20, at 09-24 22:03:16 PDT.065 msecs

Response for seq 4, from 192.0.2.20, at 09-24 22:03:16 PDT.069 msecs, rtt 10 msecs

Overlay-segment not present at RVTEP 192.0.2.20

Request for seq 5, to 192.0.2.20, at 09-24 22:03:16 PDT.076 msecs

Response for seq 5, from 192.0.2.20, at 09-24 22:03:16 PDT.079 msecs, rtt 10 msecs

Overlay-segment not present at RVTEP 192.0.2.20

## Overlay Traceroute

On VTEP1, initiate an overlay traceroute:

```
user@switch> traceroute overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst
192.0.2.20
traceroute-overlay protocol vxlan

vni 100
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:00:00:00:00
ttl 255
```

WARNING: following hash-parameters are missing -  
hash computation may not succeed

```
end-host smac
end-host dmac
end-host src ip
end-host dst ip
end-host vlan
end-host input interface
end-host protocol
end-host l4-src-port
end-host l4-dst-port
```

t1	Address	Sender Timestamp	Receiver Timestamp
Response Time			
1	10.1.0.1	09-25 00:51:10 PDT.599 msecs	*
10 msecs			
2	192.0.2.20	09-25 00:51:10 PDT.621 msecs	09-25 00:51:10 PDT.635 msecs
21 msecs			

Overlay-segment not present at RVTEP 192.0.2.20

**Meaning** The sample overlay ping output indicates the following:

- VTEP1 sent five ping requests to VTEP2, and VTEP2 responded to each request.
- VTEP2 indicated that the VNI of 100 is not configured (**Overlay-segment not present at RVTEP 192.0.2.20**) and included this information in its response to VTEP1.

The sample overlay traceroute output indicates the following:

- Upon receiving an overlay traceroute packet with a time-to-live (TTL) value of 1 hop, the Layer 3 router responds to VTEP1.
- Upon receiving an overlay traceroute packet with a TTL value of 2 hops, VTEP2 responds to VTEP1.
- VTEP2 indicated that the VNI of 100 is not configured (**Overlay-segment not present at RVTEP 192.0.2.20**) and included this information in its response to VTEP1.



**NOTE:** The asterisk (\*) in the Receiver Timestamp column of the overlay traceroute output indicates that the Layer 3 router that received the overlay traceroute packet is not a Juniper Networks device or is a Juniper Networks device that does not support overlay traceroute.

Given that the output of both overlay ping and traceroute indicates that VXLAN 100 is not present, check for this configuration on VTEP2. If you must configure a VNI of 100 on VTEP2, use the **vni** configuration statement at the **[edit vlans vlan-id vxlan]** hierarchy level, and reissue the **ping overlay** or **traceroute overlay** command to verify that VXLAN 100 is now recognized.

## Scenario 2: Verifying That the MAC Address of the Destination Endpoint Is on VTEP2

**Purpose** Verify that the MAC address (00:00:5E:00:53:cc) of physical server C, which is the destination endpoint, is in the forwarding table of VTEP2. You can use either overlay ping or traceroute to perform this verification.

### Overlay Ping Action

On VTEP1, initiate an overlay ping:

```
user@switch> ping overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst 192.0.2.20
mac 00:00:5E:00:53:cc count 5
ping-overlay protocol vxlan
```

```
vni 100
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:5E:00:53:cc
count 5
ttl 255
```

WARNING: following hash-parameters are missing -  
hash computation may not succeed

```
end-host smac
end-host dmac
end-host src ip
end-host dst ip
end-host vlan
end-host input interface
end-host protocol
end-host 14-src-port
end-host 14-dst-port
```

Request for seq 1, to 192.0.2.20, at 09-24 23:53:54 PDT.089 msecs

Response for seq 1, from 192.0.2.20, at 09-24 23:53:54 PDT.089 msecs, rtt 6 msecs

Overlay-segment present at RVTEP 192.0.2.20

End-System Not Present

Request for seq 2, to 192.0.2.20, at 09-24 23:53:54 PDT.096 msecs

Response for seq 2, from 192.0.2.20, at 09-24 23:53:54 PDT.100 msecs, rtt 10 msecs

Overlay-segment present at RVTEP 192.0.2.20

End-System Not Present

Request for seq 3, to 192.0.2.20, at 09-24 23:53:54 PDT.107 msecs

Response for seq 3, from 192.0.2.20, at 09-24 23:53:54 PDT.111 msecs, rtt 10 msecs

Overlay-segment present at RVTEP 192.0.2.20

End-System Not Present

Request for seq 4, to 192.0.2.20, at 09-24 23:53:54 PDT.118 msecs

Response for seq 4, from 192.0.2.20, at 09-24 23:53:54 PDT.122 msecs, rtt 11 msecs

Overlay-segment present at RVTEP 192.0.2.20

End-System Not Present

Request for seq 5, to 192.0.2.20, at 09-24 23:53:54 PDT.129 msecs

Response for seq 5, from 192.0.2.20, at 09-24 23:53:54 PDT.133 msecs, rtt 10 msecs

Overlay-segment present at RVTEP 192.0.2.20

End-System Not Present

## Overlay Traceroute

On VTEP1, initiate an overlay traceroute:

```
user@switch> traceroute overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst
192.0.2.20 mac 00:00:5E:00:53:cc
traceroute-overlay protocol vxlan
```

```
vni 100
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:5E:00:53:cc
ttl 255
```

WARNING: following hash-parameters are missing -  
hash computation may not succeed

```
end-host smac
end-host dmac
end-host src ip
end-host dst ip
end-host vlan
end-host input interface
end-host protocol
end-host 14-src-port
end-host 14-dst-port
```

ttl	Address	Sender Timestamp	Receiver Timestamp
Response Time			
1	10.1.0.1	09-25 00:56:17 PDT.663 msecs	*
10 msecs			
2	192.0.2.20	09-25 00:56:17 PDT.684 msecs	09-25 00:56:17 PDT.689 msecs
11 msecs			

Overlay-segment present at RVTEP 192.0.2.20

End-System Not Present

**Meaning** The sample overlay ping output indicates the following:

- VTEP1 sent five ping requests to VTEP2, and VTEP2 responded to each request.
- VTEP2 verified that the VNI of 100 is configured (**Overlay-segment present at RVTEP 192.0.2.20**) but that the MAC address of physical server C is not in the forwarding table (**End-System Not Present**). VTEP2 included this information in its response to VTEP1.

The sample overlay traceroute output indicates the following:

- Upon receiving an overlay traceroute packet with a TTL value of 1 hop, the Layer 3 router responds to VTEP1.
- Upon receiving an overlay traceroute packet with a TTL value of 2 hops, VTEP2 responds to VTEP1.
- VTEP2 verified that the VNI of 100 is configured (**Overlay-segment present at RVTEP 192.0.2.20**) but that the MAC address of physical server C is not in the forwarding table (**End-System Not Present**). VTEP2 included this information in its response to VTEP1.



**NOTE:** The asterisk (\*) in the Receiver Timestamp column of the overlay traceroute output indicates that the Layer 3 router that received the overlay traceroute packet is not a Juniper Networks device or is a Juniper Networks device that does not support overlay traceroute.

---

Given that the output of both overlay ping and traceroute indicates that the MAC address of physical server C is not known by VTEP2, you must further investigate to determine why this MAC address is not in the forwarding table of VTEP2.

### Scenario 3: Verifying a Data Flow

---

**Purpose** Verify that there are no issues that might impede the flow of data from physical server A to physical server C. The networking devices that support this flow include VTEP1, the Layer 3 router with the IP address of 192.0.2.30, and VTEP2 (see [Figure 5 on page 103](#)).

Initially, use overlay ping, and if the overlay ping results indicate an issue, then use overlay traceroute to determine in which segment of the path the issue exists.

With both overlay ping and traceroute, use the hash parameters to specify information about the devices in this data flow so that the system can calculate a VXLAN UDP header source port hash, which is included in the VXLAN UDP header of the overlay ping and traceroute packets. With the calculated hash included in the VXLAN UDP header, the overlay ping and traceroute packets can emulate data packets in this flow, which should produce more accurate ping and traceroute results.



**BEST PRACTICE:** When using the hash parameters, we recommend specifying a value for each parameter. The exception to this guideline is the hash-vlan parameter, which you do not have to use if the source endpoint is not a member of a VLAN. This practice ensures that the overlay ping and traceroute processes are successful and that the output for each command is accurate. If you do not specify a value for one or more of the hash parameters, the system sends an OAM request that might include incorrect hash values and generates a warning message.

## Overlay Ping    Action

On VTEP1, initiate an overlay ping:

```
user@switch> ping overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst 192.0.2.20
mac 00:00:5E:00:53:cc count 5 hash-source-mac 00:00:5E:00:53:aa hash-destination-mac
00:00:5E:00:53:cc hash-source-address 198.51.100.1 hash-destination-address 198.51.100.3
hash-vlan 150 hash-input-interface xe-0/0/2 hash-protocol 17 hash-source-port 4456
hash-destination-port 4540
ping-overlay protocol vxlan
```

```
vni 100
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:5E:00:53:cc
count 5
ttl 255
```

```
hash-parameters:
  input-ifd-idx 653
  end-host smac 00:00:5E:00:53:aa
  end-host dmac 00:00:5E:00:53:cc
  end-host src ip 198.51.100.1
  end-host dst ip 198.51.100.3
  end-host protocol 17
  end-host 14-src-port 4456
  end-host 14-dst-port 4540
  end-host vlan 150
```

Request for seq 1, to 192.0.2.20, at 09-24 19:15:33 PDT.352 msecs

Request for seq 2, to 192.0.2.20, at 09-24 19:15:33 PDT.363 msecs

Request for seq 3, to 192.0.2.20, at 09-24 19:15:33 PDT.374 msecs

Request for seq 4, to 192.0.2.20, at 09-24 19:15:33 PDT.385 msecs

Request for seq 5, to 192.0.2.20, at 09-24 19:15:33 PDT.396 msecs

## Overlay Traceroute

If needed, on VTEP1, initiate an overlay traceroute:

```
user@switch> traceroute overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst
192.0.2.20 mac 00:00:5E:00:53:cc hash-source-mac 00:00:5E:00:53:aa hash-destination-mac
```

```
00:00:5E:00:53:cc hash-source-address 198.51.100.1 hash-destination-address 198.51.100.3
hash-vlan 150 hash-input-interface xe-0/0/2 hash-protocol 17 hash-source-port 4456
hash-destination-port 4540
traceroute-overlay protocol vxlan
```

```
vni 100
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:5E:00:53:cc
ttl 255

hash-parameters:
    input-ifd-idx 653
    end-host smac 00:00:5E:00:53:aa
    end-host dmac 00:00:5E:00:53:cc
    end-host src ip 198.51.100.1
    end-host dst ip 198.51.100.3
    end-host protocol 17
    end-host 14-src-port 4456
    end-host 14-dst-port 4540
    end-host vlan 150
```

ttl	Address	Sender Timestamp	Receiver Timestamp
Response Time			
1	10.1.0.1	09-25 00:56:17 PDT.663 msec	*
10 msec			

**Meaning** The sample overlay ping output indicates that VTEP1 sent five ping requests to VTEP2, but VTEP2 did not respond to any of the requests. The lack of response from VTEP2 indicates that a connectivity issue exists along the path between VTEP1 and the Layer 3 router or the path between the Layer 3 router and VTEP2.

To further troubleshoot in which path the issue lies, overlay traceroute is used. The sample overlay traceroute output indicates the following:

- Upon receiving an overlay traceroute packet with a TTL value of 1 hop, the Layer 3 router responds to VTEP1, which indicates that the path between VTEP1 and the Layer 3 router is up.
- VTEP2 does not respond to the overlay traceroute packet, which indicates that the path between the Layer 3 router and VTEP2 might be down.



**NOTE:** The asterisk (\*) in the Receiver Timestamp column of the overlay traceroute output indicates that the Layer 3 router that received the overlay traceroute packet is not a Juniper Networks device or is a Juniper Networks device that does not support overlay traceroute.

Given that the overlay traceroute output indicates that there is a connectivity issue between the Layer 3 router and VTEP2, you must further investigate this path segment to determine the source of the issue.



- Related Documentation**
- [Understanding Overlay ping and traceroute Packet Support on page 98](#)
  - [ping overlay on page 114](#)
  - [traceroute overlay on page 130](#)

## ping overlay

**Syntax**    `ping overlay`  
               `<tunnel-type>`  
               `vni vni`  
               `tunnel-src ip-source-address`  
               `tunnel-dst ip-destination-address`  
               `<mac mac-address>`  
               `<count requests>`  
               `<ttl value>`  
               `<hash-source-mac source-mac-address>`  
               `<hash-destination-mac destination-mac-address>`  
               `<hash-source-address source-IP-address>`  
               `<hash-destination-address destination-IP-address>`  
               `<hash-vlan vlan-id>`  
               `<hash-input-interface input-interface>`  
               `<hash-protocol protocol-id>`  
               `<hash-source-port source-layer4-port>`  
               `<hash-destination-port destination-layer4-port>`

**Release Information**    Command introduced in Junos OS Release 14.1X53-D30 for QFX Series switches.  
                               Command introduced in Junos OS Release 16.1 for EX Series switches.  
                               Command introduced in Junos OS Release 16.2 for MX Series routers.

**Description**    Verify the presence of the Virtual Extensible LAN (VXLAN) tunnel endpoints (VTEPs), which can originate and terminate VXLAN tunnels, and service connectivity within the context of the overlay VXLAN segment. Use **ping overlay** as a fault detection tool to determine failure within an overlay VXLAN tunnel. Type **Ctrl+c** to interrupt a **ping overlay** command.



**NOTE:** The **ping overlay** command is not supported for IPv6.

**Options**    **tunnel-type**—(Optional) Specify the overlay tunnel type used in a virtualized environment such as: VXLAN, Network Virtualization using Generic Routing Encapsulation (NVGRE), MPLS over User Datagram Protocol (UDP), and MPLS over General Routing Encapsulation (GRE) tunnels.



**NOTE:** Only VXLAN overlay tunnel types are supported.

**vni vni**—Specify the VNI of the VXLAN overlay segment.

**tunnel-src ip-source-address**—Specify the IP address of the source entity at the end of the tunnel, such as the source VTEP.

**tunnel-dst *ip-destination-address***—Specify the IP address of the destination entity at the end of the tunnel, such as a remote VTEP.

**mac *mac-address***—(Optional) Include the physical or hardware address on the end host system you are trying to reach.

**count *requests***—(Optional) Number of ping requests to send.

For QFX and EX9200 switches, the range of values is 1 through **65,535**. The default value is **10**.

For MX Series routers, the range of values is 1 through **2,000,000,000**. The default value is **5**.

**ttl *value***—(Optional) Time-to-live (TTL) value to include in the ping request.

For QFX and EX9200 switches, the range of values is 1 through **255**. The default value is **255**.

For MX Series routers, the range of values is **0** through **255**. The default value is **255**.

**hash-source-mac *source-mac-address***—(Optional) Specify the MAC address of the source end host system.



**NOTE:** The hash parameters provide values that correspond to a particular data flow that the ping overlay command debugs. Based on the values that you specify, the system calculates a VXLAN UDP header source port hash, which is included in the VXLAN UDP header of the overlay ping and traceroute packets. Including the calculated hash in the VXLAN header enables the overlay ping and traceroute packets to emulate data packets in the flow that you are troubleshooting.

When using the hash parameters, we recommend that you specify a value for each parameter. The exception to this guideline is the hash-vlan parameter, which you do not have to use if the source endpoint is not a member of a VLAN. This practice ensures that the overlay ping and traceroute processes are successful and that the output for each command is accurate. If you do not specify a value for one or more of the hash parameters, the system sends an OAM request that might include incorrect hash values and generates a warning message.

Hash computation supports TCP and UDP protocols only.

**hash-destination-mac *destination-mac-address***—(Optional) Specify the MAC address of the destination end host system.

**hash-source-address *source-IP-address***—(Optional) Specify the IP address of the source end host system.

**hash-destination-address** *destination-IP-address*—(Optional) Specify the IP address of the destination end host system.

**hash-vlan** *vlan-id*—(Optional, QFX switches only) Specify the VLAN ID of the end host system.

**hash-input-interface** *input-interface*—(Optional, QFX switches only) Specify the ingress interface of the flow on the Juniper Networks device.

**hash-protocol** *protocol-id*—(Optional) Specify the TCP/UDP IP protocol ID. The range of values is 1 through 255.

**hash-source-port** *source-layer4-port*—(Optional) Specify the Layer 4 source port. The range of values is 1 through 65,535.

**hash-destination-port** *destination-layer4-port*—(Optional) Specify the Layer 4 destination port. The range of values is 1 through 65,535.

**Required Privilege Level** network

- Related Documentation**
- [Understanding Overlay ping and traceroute Packet Support on page 98](#)
  - [Example: Troubleshooting a VXLAN Overlay Network By Using Overlay Ping and Traceroute on QFX Series Switches on page 101](#)
  - [traceroute overlay on page 130](#)

**List of Sample Output** [run ping overlay on page 117](#)

**Output Fields** When you enter this command, you are provided feedback on the status of your request. An exclamation point (!) indicates that an echo reply was received. A period (.) indicates that an echo reply was not received within the timeout period. An x indicates that an echo reply was received with an error code. These packets are not counted in the received packets count. They are accounted for separately.

[Table 23 on page 116](#) lists the output fields for the **ping overlay** command. Output fields are listed in the approximate order in which they appear.

**Table 23: ping overlay Output Fields**

Field Name	Field Description
vni	The VNI of the VXLAN overlay segment.
tunnel src ip	The IP address of the source end of the tunnel.
tunnel dst ip	The IP address of the destination end of the tunnel.
mac address	The physical or hardware address on the end host system you are trying to reach.

Table 23: ping overlay Output Fields (continued)

Field Name	Field Description
count	Number of ping requests sent.
tll	TTL value for maximum number of pings.
hash-parameters	The hash parameters provide the input-interface, source MAC address, destination MAC address, source IP address, destination IP address, and the VLAN of the two end hosts within an overlay segment. Hash parameters enable platform-specific hash computation to use as the source port in the outer UDP header.
Request/Response for seq x to/from address at timestamp	Number of ping request and response counts for determining overlay segments in tunnel.

## Sample Output

### run ping overlay

```
user@host> ping overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst 192.0.2.20
mac 00:00:5E:00:53:cc count 5 hash-source-mac 00:00:5E:00:53:aa hash-destination-mac
00:00:5E:00:53:cc hash-source-address 198.51.100.1 hash-destination-address 198.51.100.3
hash-vlan 150 hash-input-interface xe-0/0/2 hash-protocol 17 hash-source-port 4456
hash-destination-port 4540
```

```
vni 100
```

```
tunnel src ip 192.0.2.10
tunnel dst ip 192.0.2.20
mac address 00:00:5E:00:53:cc
count 5
ttl 255
```

```
hash-parameters:
```

```
input-ifd-idx 653
end-host smac 00:00:5E:00:53:aa
end-host dmac 00:00:5E:00:53:cc
end-host src ip 198.51.100.1
end-host dst ip 198.51.100.3
end-host protocol 17
end-host 14-src-port 4456
end-host 14-dst-port 4540
end-host vlan 150
```

```
Request for seq 1, to 192.0.2.20, at 09-24 19:15:33 PDT.352 msecs
```

```
Response for seq 1, from 192.0.2.20, at 09-24 19:15:33 PDT.359 msecs, rtt 11 msecs
```

```
Overlay-segment present at RVTEP 192.0.2.20
```

```
End-System Present
```

```
Request for seq 2, to 192.0.2.20, at 09-24 19:15:33 PDT.363 msecs
```

```
Response for seq 2, from 192.0.2.20, at 09-24 19:15:33 PDT.370 msecs, rtt 10 msecs
```

Overlay-segment present at RVTEP 192.0.2.20

End-System Present

Request for seq 3, to 192.0.2.20, at 09-24 19:15:33 PDT.374 msec

Response for seq 3, from 192.0.2.20, at 09-24 19:15:33 PDT.381 msec, rtt 10 msec

Overlay-segment present at RVTEP 192.0.2.20

End-System Present

Request for seq 4, to 192.0.2.20, at 09-24 19:15:33 PDT.385 msec

Response for seq 4, from 192.0.2.20, at 09-24 19:15:33 PDT.392 msec, rtt 10 msec

Overlay-segment present at RVTEP 192.0.2.20

End-System Present

Request for seq 5, to 192.0.2.20, at 09-24 19:15:33 PDT.396 msec

Response for seq 5, from 192.0.2.20, at 09-24 19:15:33 PDT.403 msec, rtt 11 msec

Overlay-segment present at RVTEP 192.0.2.20

End-System Present

## show bridge mac-table

<b>Syntax</b>	<pre>show bridge mac-table   &lt;age&gt;   &lt;brief   count   detail   extensive&gt;   &lt;bridge-domain (all   <i>bridge-domain-name</i>)&gt;   &lt;global-count&gt;   &lt;instance <i>instance-name</i>&gt;   &lt;interface <i>interface-name</i>&gt;   &lt;mac-address&gt;   &lt;instance <i>instance-name</i>&gt;   &lt;vlan-id (all-vlan   <i>vlan-id</i>)&gt;</pre>
<b>Release Information</b>	<p>Command introduced in Junos OS Release 8.4.</p> <p>Command introduced in Junos OS Release 15.1</p> <p>Support for PBB-EVPN instance added in Junos OS Release 16.1</p> <p>MAC Flag P to indicate a MAC Pinned interface introduced in Junos OS 16.2</p>
<b>Description</b>	(MX Series routers only) Display Layer 2 MAC address information.
<b>Options</b>	<p><b>none</b>—Display all learned Layer 2 MAC address information.</p> <p><b>age</b>— (Optional) Display age of a single mac-address.</p> <p><b>brief   count   detail   extensive</b>—(Optional) Display the specified level of output.</p> <p><b>bridge-domain (all   <i>bridge-domain-name</i>)</b>—(Optional) Display learned Layer 2 MAC addresses for all bridging domains or for the specified bridging domain.</p> <p><b>global-count</b>—(Optional) Display the total number of learned Layer 2 MAC addresses on the system.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display learned Layer 2 MAC addresses for the specified routing instance.</p> <p><b>interface <i>interface-name</i></b>—(Optional) Display learned Layer 2 MAC addresses for the specified interface.</p> <p><b>mac-address</b>—(Optional) Display the specified learned Layer 2 MAC address information.</p> <p><b>vlan-id (all-vlan   <i>vlan-id</i>)</b>—(Optional) Display learned Layer 2 MAC addresses for all VLANs or for the specified VLAN.</p>
<b>Additional Information</b>	<p>When Layer 2 protocol tunneling is enabled, the tunneling MAC address 01:00:0c:cd:cd:d0 is installed in the MAC table. When the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunk Protocol (VTP) is configured for Layer 2 protocol tunneling on an interface, the corresponding protocol MAC address is installed in the MAC table.</p>

**Required Privilege Level** view

**List of Sample Output** [show bridge mac-table on page 121](#)  
[show bridge mac-table \(with Layer 2 Services over GRE Interfaces\) on page 121](#)  
[show bridge mac-table \(with VXLAN enabled\) on page 122](#)  
[show bridge mac-table age \(for GE interface\) on page 122](#)  
[show bridge mac-table age \(for AE interface\) on page 122](#)  
[show bridge mac-table count on page 122](#)  
[show bridge mac-table detail on page 123](#)  
[show bridge mac-table instance pbb-evpn on page 123](#)  
[show bridge mac-table on page 123](#)

**Output Fields** [Table 24 on page 120](#) describes the output fields for the **show bridge mac-table** command. Output fields are listed in the approximate order in which they appear.

*Table 24: show bridge mac-table Output Fields*

Field Name	Field Description
Age	Age of a single mac-address.
<b>Routing instance</b>	Name of the routing instance.
Bridging domain	Name of the bridging domain.
MAC address	MAC address or addresses learned on a logical interface.
MAC flags	Status of MAC address learning properties for each interface: <ul style="list-style-type: none"> <li>• <b>S</b>—Static MAC address is configured.</li> <li>• <b>D</b>—Dynamic MAC address is configured.</li> <li>• <b>L</b>—Locally learned MAC address is configured.</li> <li>• <b>C</b>—Control MAC address is configured.</li> <li>• <b>SE</b>—MAC accounting is enabled.</li> <li>• <b>NM</b>—Non-configured MAC.</li> <li>• <b>R</b>—Remote PE MAC address is configured.</li> <li>• <b>P</b>—MAC Pinned interface is configured</li> </ul>
Logical interface	Name of the logical interface.
MAC count	Number of MAC addresses learned on the specific routing instance or interface.
Learning interface	Name of the logical interface on which the MAC address was learned.
Learning VLAN	VLAN ID of the routing instance or bridge domain in which the MAC address was learned.
VXLAN ID/VXLAN	VXLAN Network Identifier (VNI).



Table 24: show bridge mac-table Output Fields (continued)

Field Name	Field Description
Layer 2 flags	Debugging flags signifying that the MAC address is present in various lists.
Epoch	Spanning Tree Protocol epoch number identifying when the MAC address was learned. Used for debugging.
Sequence number	Sequence number assigned to this MAC address. Used for debugging.
Learning mask	Mask of the Packet Forwarding Engines where this MAC address was learned. Used for debugging.
IPC generation	Creation time of the logical interface when this MAC address was learned. Used for debugging.

## Sample Output

### show bridge mac-table

```
user@host> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
          SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC)
```

```
Routing instance : default-switch
Bridging domain : test1, VLAN : 1
  MAC          MAC      Logical      NH      RTR
  address      flags    interface  Index   ID
01:00:0c:cc:cc:cc S,NM    NULL
01:00:0c:cc:cc:cd S,NM    NULL
01:00:0c:cd:cd:d0 S,NM    NULL
64:87:88:6a:17:d0 D        ae0.1
64:87:88:6a:17:f0 D        ae0.1
```

### show bridge mac-table (with Layer 2 Services over GRE Interfaces)

```
user@host> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC, L -locally learned
          SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC)
```

```
Routing instance : default-switch
Bridging domain : vlan-1, VLAN : 1
  MAC          MAC      Logical
  address      flags    interface
00:01:01:00:01:f7 D,SE    gr-1/2/10.0
00:03:00:32:01:f7 D,SE    gr-1/2/10.0
00:00:21:11:11:10 DL      ge-1/0/0.0
00:00:21:11:11:11 DL      ge-1/1/0.0
```

```
Routing instance : default-switch
Bridging domain : vlan-2, VLAN : 2
  MAC          MAC      Logical
  address      flags    interface
00:02:01:33:01:f7 D,SE    gr-1/2/10.1
```

```

00:00:21:11:21:10 DL ge-1/0/0.1
00:00:21:11:21:11 DL ge-1/1/0.1

```

### show bridge mac-table (with VXLAN enabled)

```

user@host> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC, L -locally learned
          SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC)

Routing instance : default-switch
Bridging domain : vlan-1, VLAN : 1
VXLAN: Id : 100, Multicast group: 233.252.0.1
MAC      MAC      Logical
address  flags   interface
00:01:01:00:01:f7 D,SE    vtep.1052010
00:03:00:32:01:f7 D,SE    vtep.1052011
00:00:21:11:11:10 DL       ge-1/0/0.0
00:00:21:11:11:11 DL       ge-1/1/0.0

Routing instance : default-switch
Bridging domain : vlan-2, VLAN : 2, VXLAN : 200
VXLAN: Id : 200, Multicast group: 233.252.0.2
MAC      MAC      Logical
address  flags   interface
00:02:01:33:01:f7 D,SE    vtep.1052010
00:04:00:14:01:f7 D,SE    vtep.1052011
00:00:21:11:21:10 DL       ge-1/0/0.1
00:00:21:11:21:11 DL       ge-1/1/0.1

```

### show bridge mac-table age (for GE interface)

```

user@host> show vpls mac-table age 00:02:03:aa:bb:1a instance vpls_instance_1
MAC Entry Age information
Current Age: 4 seconds

```

### show bridge mac-table age (for AE interface)

```

user@host> show vpls mac-table age 00:02:03:aa:bb:1a instance vpls_instance_1
MAC Entry Age information
Current Age on FPC1: 102 seconds
Current Age on FPC2: 94 seconds

```

### show bridge mac-table count

```

user@host> show bridge mac-table count
2 MAC address learned in routing instance vs1 bridge domain vlan100

MAC address count per interface within routing instance:
Logical interface      MAC count
ge-11/0/3.0            1
ge-11/1/4.100          0
ge-11/1/1.100          0
ge-11/1/0.100          0
xe-10/2/0.100          1
xe-10/0/0.100          0

MAC address count per learn VLAN within routing instance:
Learn VLAN ID          MAC count

```

```

0                                2

0 MAC address learned in routing instance vs1 bridge domain vlan200

MAC address count per interface within routing instance:
Logical interface      MAC count
ge-11/1/0.200          0
ge-11/1/1.200          0
ge-11/1/4.200          0
xe-10/0/0.200          0
xe-10/2/0.200          0

MAC address count per learn VLAN within routing instance:
Learn VLAN ID          MAC count
0                        0

```

### show bridge mac-table detail

```

user@host> show bridge mac-table detail
MAC address: 00:00:00:19:1c:db
Routing instance: vs1
Bridging domain: vlan100
Learning interface: ge-11/0/3.0   Learning VLAN: 0
Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
Epoch: 4                         Sequence number: 0
Learning mask: 0x800              IPC generation: 0

MAC address: 00:00:00:59:3a:2f
Routing instance: vs1
Bridging domain: vlan100
Learning interface: xe-10/2/0.100 Learning VLAN: 0
Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
Epoch: 7                         Sequence number: 0
Learning mask: 0x400              IPC generation: 0

```

### show bridge mac-table instance pbb-evpn

```

user@host> show bridge mac-table instance pbb-evpn
Routing instance : pbb-evpn
Bridging domain : isid-bd10000, ISID : 10000
MAC          MAC      Logical      NH      RTR
address      flags      interface  Index   ID
00:19:e2:b0:76:eb  D      cbp.1000
aa:bb:cc:dd:ee:f2  DC
aa:bb:cc:dd:ee:f3  DC      1048576 1048576
1048575 1048575

```

### show bridge mac-table

```

user@host>run show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC,
P -Pinned MAC)

Routing instance : VS-541
Bridging domain : 541, VLAN : 541
MAC MAC Logical NH RTR
address flags interface Index ID
00:00:01:00:00:01 DPRC xe-0/0/3.0
00:00:02:00:00:01 DP  xe-0/0/3.0

```



## show vpls mac-table

<b>Syntax</b>	<pre>show vpls mac-table   &lt;age&gt;   &lt;brief   detail   extensive   summary&gt;   &lt;bridge-domain <i>bridge-domain-name</i>&gt;   &lt;instance <i>instance-name</i>&gt;   &lt;interface <i>interface-name</i>&gt;   &lt;logical-system (all   <i>logical-system-name</i>)&gt;   &lt;mac-address&gt;   &lt;vlan-id <i>vlan-id-number</i>&gt;</pre>
<b>Release Information</b>	<p>Command introduced in Junos OS Release 8.5.</p> <p>Command introduced in Junos OS Release 15.1.</p>
<b>Description</b>	Display learned virtual private LAN service (VPLS) media access control (MAC) address information.
<b>Options</b>	<p><b>none</b>—Display all learned VPLS MAC address information.</p> <p><b>age</b>— (Optional) Display age of a single mac-address.</p> <p><b>brief   detail   extensive   summary</b>—(Optional) Display the specified level of output.</p> <p><b>bridge-domain <i>bridge-domain-name</i></b>—(Optional) Display learned VPLS MAC addresses for the specified bridge domain.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display learned VPLS MAC addresses for the specified instance.</p> <p><b>interface <i>interface-name</i></b>—(Optional) Display learned VPLS MAC addresses for the specified instance.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Display learned VPLS MAC addresses for all logical systems or for the specified logical system.</p> <p><b>mac-address</b>—(Optional) Display the specified learned VPLS MAC address information..</p> <p><b>vlan-id <i>vlan-id-number</i></b>—(Optional) Display learned VPLS MAC addresses for the specified VLAN.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<p><a href="#">show vpls mac-table on page 127</a></p> <p><a href="#">show vpls mac-table (with Layer 2 Services over GRE Interfaces) on page 127</a></p> <p><a href="#">show vpls mac-table (with VXLAN enabled) on page 127</a></p> <p><a href="#">show vpls mac-table age (for GE interface) on page 128</a></p> <p><a href="#">show vpls mac-table age (for AE interface) on page 128</a></p> <p><a href="#">show vpls mac-table count on page 128</a></p>

[show vpls mac-table detail on page 129](#)

[show vpls mac-table extensive on page 129](#)

**Output Fields** [Table 25 on page 126](#) describes the output fields for the **show vpls mac-table** command. Output fields are listed in the approximate order in which they appear.

*Table 25: show vpls mac-table Output fields*

Field Name	Field Description
Age	Age of a single mac-address.
Routing instance	Name of the routing instance.
Bridging domain	Name of the bridging domain.
MAC address	MAC address or addresses learned on a logical interface.
MAC flags	Status of MAC address learning properties for each interface: <ul style="list-style-type: none"> <li>• <b>S</b>—Static MAC address configured.</li> <li>• <b>D</b>—Dynamic MAC address learned.</li> <li>• <b>SE</b>—MAC accounting is enabled.</li> <li>• <b>NM</b>—Nonconfigured MAC.</li> </ul>
Logical interface	Name of the logical interface.
MAC count	Number of MAC addresses learned on a specific routing instance or interface.
Learning interface	Logical interface or logical Label Switched Interface (LSI) the address is learned on.
Base learning interface	Base learning interface of the MAC address. This field is introduced in Junos OS Release 14.2.
Learn VLAN ID/VLAN	VLAN ID of the routing instance or bridge domain in which the MAC address was learned.
VXLAN ID/VXLAN	VXLAN Network Identifier (VNI)
Layer 2 flags	Debugging flags signifying that the MAC address is present in various lists.
Epoch	Spanning Tree Protocol epoch number identifying when the MAC address was learned. Used for debugging.
Sequence number	Sequence number assigned to this MAC address. Used for debugging.
Learning mask	Mask of Packet Forwarding Engines where this MAC address was learned. Used for debugging.
IPC generation	Creation time of the logical interface when this MAC address was learned. Used for debugging.

## Sample Output

### show vpls mac-table

```
user@host> show vpls mac-table
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : vpls_ldp1
VLAN : 223
  MAC          MAC      Logical
  address      flags    interface
  00:00:5e:00:53:5d  D      ge-0/2/5.400

MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)

Routing instance : vpls_red
VLAN : 401
  MAC          MAC      Logical
  address      flags    interface
  00:00:5e:00:53:12  D      lsi.1051138
  00:00:5e:00:53:f0  D      lsi.1051138
```

### show vpls mac-table (with Layer 2 Services over GRE Interfaces)

```
user@host> show vpls mac-table
MAC flags (S -static MAC, D -dynamic MAC, L -locally learned
           SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC)

Routing instance : vpls_4site:1000
Bridging domain : __vpls_4site:1000__, MAC          MAC      Logical
  address      flags    interface
  00:00:5e:00:53:f4  D,SE  ge-4/2/0.1000
  00:00:5e:00:53:33  D,SE  lsi.1052004
  00:00:5e:00:53:32  D,SE  lsi.1048840
  00:00:5e:00:53:14  D,SE  lsi.1052005
  00:00:5e:00:53:f7  D,SE  gr-1/2/10.10
```

### show vpls mac-table (with VXLAN enabled)

```
user@host> show vpls mac-table
MAC flags (S -static MAC, D -dynamic MAC, L -locally learned
           SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC)

Routing instance : vpls_4site:1000
Bridging domain : __vpls_4site:1000__, VLAN : 4094,4093
VXLAN: Id : 300, Multicast group: 233.252.0.1
  MAC          MAC      Logical
  address      flags    interface
  00:00:5e:00:53:f4  D,SE  ge-4/2/0.1000
  00:00:5e:00:53:33  D,SE  lsi.1052004
  00:00:5e:00:53:32  D,SE  lsi.1048840
  00:00:5e:00:53:14  D,SE  lsi.1052005
  00:00:5e:00:53:f7  D,SE  vtep.1052010
  00:00:5e:00:53:3f  D,SE  vtep.1052011
```

**show vpls mac-table age (for GE interface)**

```
user@host> show vpls mac-table age 00:00:5e:00:53:1a instance vpls_instance_1
MAC Entry Age information
Current Age: 4 seconds
```

**show vpls mac-table age (for AE interface)**

```
user@host> show vpls mac-table age 000:00:5e:00:53:1a instance vpls_instance_1
MAC Entry Age information
Current Age on FPC1: 102 seconds
Current Age on FPC2: 94 seconds
```

**show vpls mac-table count**

```
user@host> show vpls mac-table count
0 MAC address learned in routing instance __example_private1__
```

MAC address count per interface within routing instance:

Logical interface	MAC count
1c-0/0/0.32769	0
1c-0/1/0.32769	0
1c-0/2/0.32769	0
1c-2/0/0.32769	0
1c-0/3/0.32769	0
1c-2/1/0.32769	0
1c-9/0/0.32769	0
1c-11/0/0.32769	0
1c-2/2/0.32769	0
1c-9/1/0.32769	0
1c-11/1/0.32769	0
1c-2/3/0.32769	0
1c-9/2/0.32769	0
1c-11/2/0.32769	0
1c-11/3/0.32769	0
1c-9/3/0.32769	0

MAC address count per learn VLAN within routing instance:

Learn VLAN ID	MAC count
0	0

1 MAC address learned in routing instance vpls\_ldp1

MAC address count per interface within routing instance:

Logical interface	MAC count
lsi.1051137	0
ge-0/2/5.400	1

MAC address count per learn VLAN within routing instance:

Learn VLAN ID	MAC count
0	1

1 MAC address learned in routing instance vpls\_red

MAC address count per interface within routing instance:

Logical interface	MAC count
ge-0/2/5.300	1

MAC address count per learn VLAN within routing instance:



Learn VLAN ID	MAC count
0	1

### show vpls mac-table detail

```

user@host> show vpls mac-table detail
MAC address: 00:00:5e:00:53:5d
  Routing instance: vpls_ldp1
  Learning interface: ge-0/2/5.400
  Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
  Epoch: 0                               Sequence number: 1
  Learning mask: 0x1                      IPC generation: 0

MAC address: 00:00:5e:00:53:5d
  Routing instance: vpls_red
  Learning interface: ge-0/2/5.300
  Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
  Epoch: 0                               Sequence number: 1
  Learning mask: 0x1                      IPC generation: 0

```

### show vpls mac-table extensive

```

user@host> show vpls mac-table extensive

MAC address: 00:00:5e:00:53:00
  Routing instance: vpls_1
  Bridging domain: __vpls_1__, VLAN : NA
  Learning interface: lsi.1049165
  Base learning interface: lsi.1049165
  Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
  Epoch: 0                               Sequence number: 1
  Learning mask: 0x00000001

MAC address: 00:00:5e:00:53:01
  Routing instance: vpls_1
  Bridging domain: __vpls_1__, VLAN : NA
  Learning interface: lsi.1049165
  Base learning interface: lsi.1049165
  Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
  Epoch: 0                               Sequence number: 1
  Learning mask: 0x00000001

MAC address: 00:00:5e:00:53:02
  Routing instance: vpls_1
  Bridging domain: __vpls_1__, VLAN : NA
  Learning interface: lsi.1049165
  Base learning interface: lsi.1049165
  Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
  Epoch: 0                               Sequence number: 1
  Learning mask: 0x00000001

MAC address: 00:00:5e:00:53:03
  Routing instance: vpls_1
  Bridging domain: __vpls_1__, VLAN : NA
  Learning interface: lsi.1049165
  Base learning interface: lsi.1049165
  Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
  Epoch: 0                               Sequence number: 1
  Learning mask: 0x00000001

```

## traceroute overlay

**Syntax** `traceroute overlay`  
`<tunnel-type>`  
`vni vni`  
`tunnel-src source-ip-address`  
`tunnel-dst destination-ip-address`  
`<mac mac-address>`  
`<ttl value>`  
`<hash-input-interface input-interface>`  
`<hash-source-mac source-mac-address>`  
`<hash-destination-mac destination-mac-address>`  
`<hash-source-address source-IP-address>`  
`<hash-destination-address destination-IP-address>`  
`<hash-vlan vlan-id>`  
`<hash-protocol protocol-id>`  
`<hash-source-port source-layer4-port>`  
`<hash-destination-port destination-layer4-port>`

**Release Information** Command introduced in Junos OS Release 14.1X53-D30 for QFX Series switches.  
 Command introduced in Junos OS Release 16.1 for EX Series switches.  
 Command introduced in Junos OS Release 16.2 for MX Series routers.

**Description** Display the route that packets take between two Virtual Extensible LAN (VXLAN) tunnel endpoints (VTEPs) and within the context of a VXLAN overlay segment. Use **traceroute overlay** as an isolation and debugging tool to locate points of failure within an overlay VXLAN tunnel. The output is useful for diagnosing a point of failure in the path from the device to the destination host, and for addressing network traffic latency and throughput problems.



**NOTE:** The `traceroute overlay` command is not supported for IPv6.

**Options** **tunnel-type**—(Optional) Specify the overlay tunnel type used in a virtualized environment such as: VXLAN, Network Virtualization using Generic Routing Encapsulation (NVGRE), MPLS over User Datagram Protocol (UDP), and MPLS over General Routing Encapsulation (GRE) tunnels.



**NOTE:** Only VXLAN overlay tunnel types are supported.

**vni vni**—Specify the VNI of the VXLAN overlay segment.

**Range:** 1 through 16,777,215

**tunnel-src source-ip-address**—Specify the IP address of the source entity at end of the tunnel, such as the source VTEP.

**tunnel-dst *destination-ip-address***—Specify the IP address of the destination entity at the end of the tunnel, such as the remote VTEP.

**mac *mac-address***—(Optional) Include the physical or hardware address on the end host you are trying to reach.

**ttl *value***—(Optional) Time-to-live (TTL) value to include as the maximum number of hops in the traceroute request.

For MX Series routers, the range of values is **0** through **255**. The default value is **255**.

**Range:** (QFX Series, EX9200 switches) 1 through 255

**Default:** 255

**hash-source-mac *source-mac-address***—(Optional) Specify the MAC address of the source end host.



**NOTE:** The hash parameters provide values that correspond to a particular data flow that the `traceroute overlay` command debugs. Based on the values that you specify, the system calculates a VXLAN UDP header source port hash, which is included in the VXLAN UDP header of the overlay ping and traceroute packets. Including the calculated hash in the VXLAN header enables the overlay ping and traceroute packets to emulate data packets in the flow that you are troubleshooting.

When using the hash parameters, we recommend that you specify a value for each parameter. The exception to this guideline is the `hash-vlan` parameter, which you do not have to use if the source endpoint is not a member of a VLAN. This practice ensures that the overlay ping and traceroute processes are successful and that the output for each command is accurate. If you do not specify a value for one or more of the hash parameters, the system sends an OAM request that might include incorrect hash values and generates a warning message.

Hash computation supports TCP and UDP protocols only.

**hash-destination-mac *destination-mac-address***—(Optional) Specify the MAC address of the destination end host.

**hash-source-address *source-IP-address***—(Optional) Specify the IP address of the source end host.

**hash-destination-address *destination-IP-address***—(Optional) Specify the IP address of the destination end host.

**hash-vlan *vlan-id***—(Optional, QFX Series switches only) Specify the VLAN ID of the end host.

**Range:** 1 through 4094

**hash-input-interface *interface-name***—(Optional, QFX Series switches only) Specify the ingress interface of the flow on the Juniper Networks device.

**hash-protocol *protocol-id***—(Optional) Specify the TCP/UDP IP protocol ID of the end host.

**Range:** 1 through 255

**hash-source-port *source-layer4-port***—(Optional) Specify the Layer 4 source port of the end host.

**Range:** 1 through 65,535

**hash-destination-port *destination-layer4-port***—(Optional) Specify the Layer 4 destination port of the end host.

**Range:** 1 through 65,535

**Required Privilege Level** network

**Related Documentation**

- [Understanding Overlay ping and traceroute Packet Support on page 98](#)
- [Example: Troubleshooting a VXLAN Overlay Network By Using Overlay Ping and Traceroute on QFX Series Switches on page 101](#)
- [ping overlay on page 114](#)

**List of Sample Output** [run traceroute overlay on page 133](#)

**Output Fields** Use the **traceroute overlay** command to determine overlay segments within a VXLAN tunnel. The output is useful for diagnosing a point of failure in the path from the device to the destination host, and for addressing network traffic latency and throughput problems.

[Table 26 on page 132](#) lists the output fields for the **traceroute overlay** command. Output fields are listed in the approximate order in which they appear.

*Table 26: traceroute overlay Output Fields*

Field Name	Field Description
vni	The VNI of the VXLAN overlay segment.
tunnel src ip	The IP address of the source end of the tunnel.
tunnel dst ip	The IP address of the destination end of the tunnel.
mac address	The physical or hardware address of the end host you are trying to reach.
ttl	TTL value for the maximum number of hops in the traceroute request.

Table 26: traceroute overlay Output Fields (continued)

Field Name	Field Description
hash-parameters	The hash parameters provide the input interface, source MAC address, destination MAC address, source IP address, destination IP address, and the VLAN ID of the two end hosts within an overlay segment. Hash parameters enable platform-specific hash computation to use as the source port in the outer UDP header.
ttl	Number of hops remaining in the traceroute message. The TTL is decremented at each hop.
Address	The sending IPv4 address.
Sender Timestamp	Timestamp in microseconds when hop was sent.
Receiver Timestamp	Timestamp in microseconds when hop was received.
Response Time	Time in microseconds for traceroute to respond.

## Sample Output

### run traceroute overlay

```
user@host> traceroute overlay tunnel-type vxlan vni 100 tunnel-src 192.0.2.10 tunnel-dst
192.0.2.20 mac 00:00:5E:00:53:cc hash-source-mac 00:00:5E:00:53:aa hash-destination-mac
00:00:5E:00:53:cc hash-source-address 198.51.100.1 hash-destination-address 198.51.100.3
hash-vlan 150 hash-input-interface xe-0/0/2 hash-protocol 17 hash-source-port 4456
hash-destination-port 4540
traceroute-overlay protocol vxlan
```

```
    vni 100
    tunnel src ip 192.0.2.10
    tunnel dst ip 192.0.2.20
    mac address 00:00:5E:00:53:cc
    ttl 255
```

```
    hash-parameters:
        input-ifd-idx 653
        end-host smac 00:00:5E:00:53:aa
        end-host dmac 00:00:5E:00:53:cc
        end-host src ip 198.51.100.1
        end-host dst ip 198.51.100.3
        end-host protocol 17
        end-host l4-src-port 4456
        end-host l4-dst-port 4540
        end-host vlan 150
```

```
ttl  Address      Sender Timestamp      Receiver Timestamp
Response Time
  1   10.1.0.1    09-25 00:56:17 PDT.663 msecs      *
10 msecs
  2   192.0.2.20 09-25 00:56:17 PDT.684 msecs    09-25 00:56:17 PDT.689 msecs
11 msecs
```

```
Overlay-segment present at RVTEP 192.0.2.20
```

End-System Present

## Verifying VXLAN Reachability

**Purpose** On the local VTEP, verify that there is connectivity with the remote VTEP.

**Action** `user@switch> show ethernet-switching vxlan-tunnel-end-point remote`

Logical System Name	Id	SVTEP-IP	IFL	L3-Idx
<default>	0	10.1.1.2	100.0	0
RVTEP-IP	IFL-Idx	NH-Id		
10.1.1.2	559	1728		
VNID	MC-Group-IP			
100	233.252.0.1			

**Meaning** The remote VTEP is reachable because its IP address appears in the output. The output also shows that the VXLAN (VNI 100) and corresponding multicast group are configured correctly on the remote VTEP.

**Related Documentation**

- [Understanding VXLANs on page 3](#)
- *Manually Configuring VXLANs on QFX Series and EX4600 Switches*
- *Examples: Manually Configuring VXLANs on QFX Series and EX4600 Switches*

## Verifying That a Local VXLAN VTEP Is Configured Correctly

**Purpose** Verify that a local VTEP is correct.

**Action** `user@switch> show ethernet-switching vxlan-tunnel-end-point source`

Logical System Name	Id	SVTEP-IP	IFL	L3-Idx
<default>	0	10.1.1.1	100.0	0
L2-RTT	Bridge Domain			
default-switch	VLAN1+100			
			VNID	MC-Group-IP
			100	233.252.0.1

**Meaning** The output shows the correct tunnel source IP address (loopback address), VLAN, and multicast group for the VXLAN.

**Related Documentation**

- [Understanding VXLANs on page 3](#)

## Verifying MAC Learning from a Remote VTEP

**Purpose** Verify that a local VTEP is learning MAC addresses from a remote VTEP.

**Action** 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)

Ethernet switching table : 2 entries, 2 learned

Routing instance : default-switch

Vlan name	MAC address	MAC flags	Age	Logical interface
VLAN1	00:00:00:ff:ff:ff	D	-	vtep.12345
VLAN1	00:10:94:00:00:02	D	-	xe-0/0/0.0

**Meaning** The output shows the MAC addresses learned from the remote VTEP (in addition to those learned on the normal Layer 2 interfaces). It also shows the logical name of the remote VTEP interface (**vtep.12345** in the above output).

- Related Documentation**
- [Understanding VXLANs on page 3](#)
  - *Manually Configuring VXLANs on QFX Series and EX4600 Switches*
  - *Examples: Manually Configuring VXLANs on QFX Series and EX4600 Switches*

