Configuring Tenant Routed Multicast

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Restrictions for Tenant Routed Multicast

- Only Layer 3 Tenant Routed Multicast (TRM) is supported.
- Layer 2 TRM is not supported.
- Layer 3 TRM is not supported for IPv6 traffic in the overlay and underlay networks.
- TRM works only on the Default Multicast Distribution Tree (MDT).
- In the underlay network, TRM is supported only in the PIM-SM mode. In the overlay network, it is supported in the PIM-SM with Distributed Anycast-RP mode and PIM-SSM mode.
- In the underlay network, the spine switch should be configured as the Rendezvous Point (RP).
- In the overlay network, each of the VTEPs must be configured as the RP for TRM in Distributed Anycast-RP mode.

Information about Tenant Routed Multicast

TRM enables multicast forwarding in a VXLAN fabric that uses a BGP-based EVPN control plane. TRM provides multi-tenancy aware multicast forwarding between senders and receivers within the same or different subnets local or across VTEPs.

This feature brings the efficiency of multicast delivery to VXLAN overlay networks. TRM enables the delivery of a customer's IP multicast traffic in a multi-tenant fabric in an efficient and resilient manner. The delivery of TRM improves Layer-3 overlay multicast functionality in the networks.

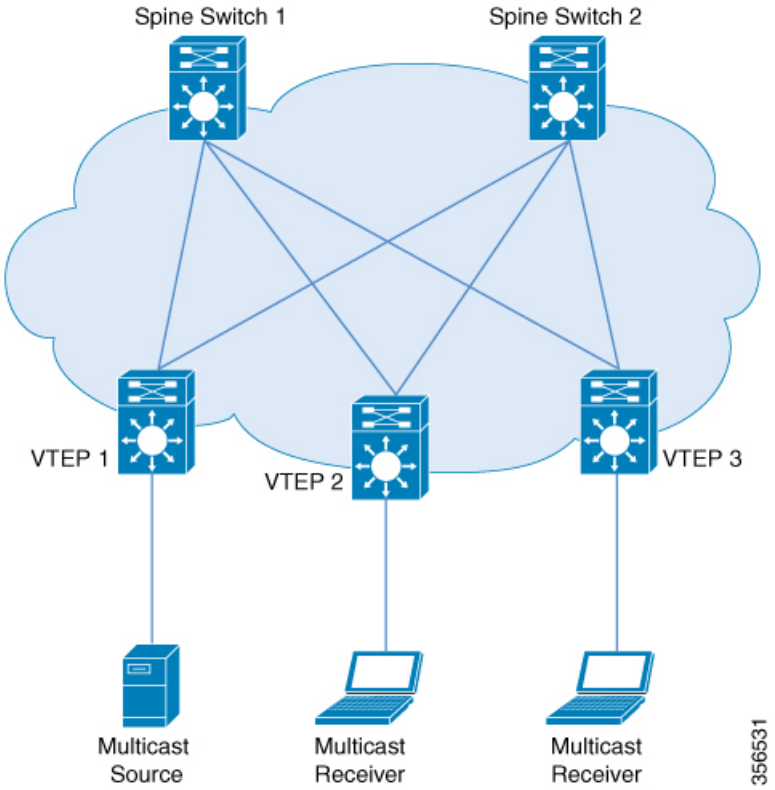
With TRM enabled, multicast forwarding in the underlay is leveraged to replicate VXLAN-encapsulated routed multicast traffic. A default-MDT is built per-VRF. This is an addition to the existing multicast groups for broadcast and unknown unicast traffic in a Layer 2 Virtual Network Instance (VNI), and for Layer 2

multicast replication group. The individual multicast group addresses in the overlay are mapped to the respective underlay multicast address for replication and transport. The advantage of using a BGP-based approach is that it allows the BGP EVPN VXLAN fabric with TRM to operate as fully distributed Overlay Rendezvous-Point (RP), with the RP presence on every edge-device or VTEP.

A multicast-enabled data center fabric is typically part of an overall multicast network. Multicast sources, receivers, and multicast rendezvous points, might reside inside the data center but might also be inside the campus or externally reachable via the WAN. TRM allows a seamless integration with existing multicast networks. It can leverage multicast rendezvous points external to the fabric. Furthermore, TRM allows for tenant-aware external connectivity using Layer-3 physical interfaces or subinterfaces.

TRM uses BGP EVPN and MVPN routes to perform multicast routing.

Figure 1: Tenant Routed Multicast Topology



Source detection triggers advertising of EVPN route type 2 in the EVPN fabric. This EVPN route installed in Layer 3 RIB at a receiver VTEP is used as the RPF route towards the source. Thus, if the source is undetected, the RPF for the (S,G) entry is not found. In this case, either RPF remains NULL or a less specific route is installed if present in the RIB.

In EVPN-VXLAN network, TRM supports two modes in the overlay network:

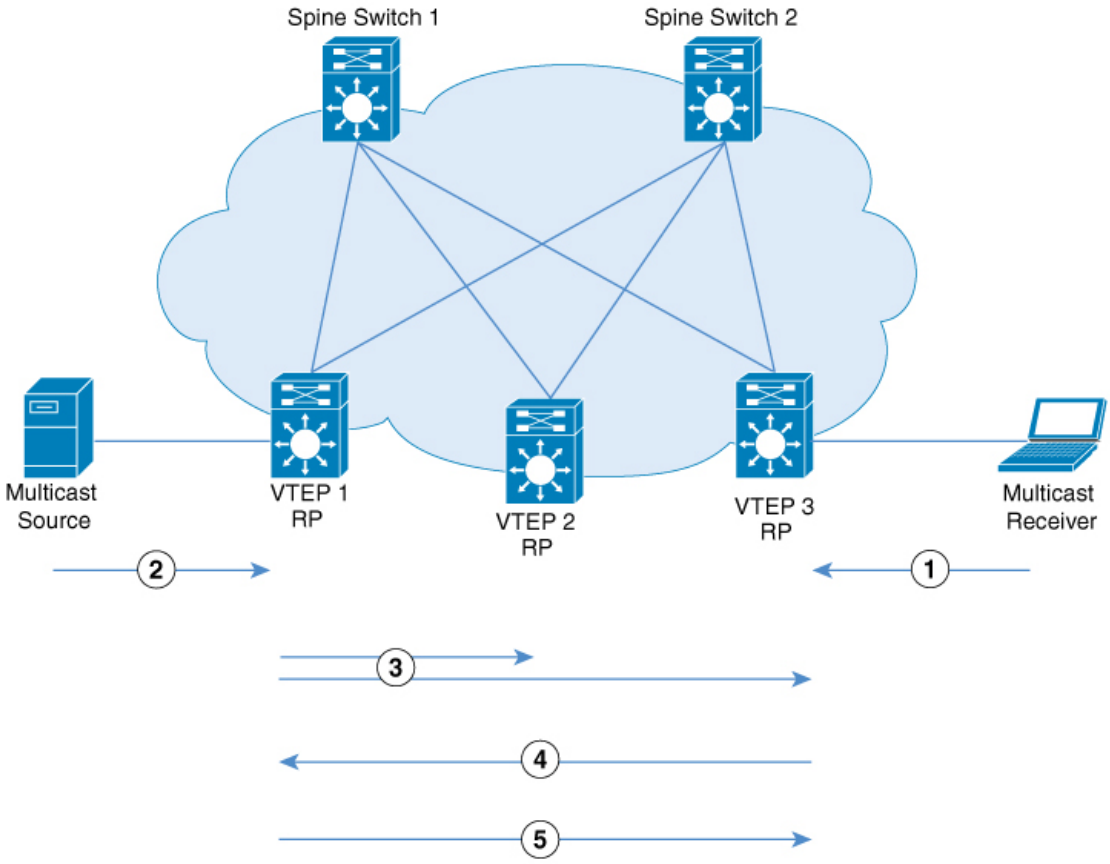
- PIM-SM with Distributed Anycast-RP
- PIM-SSM

PIM-SM with Distributed Anycast-RP Mode

In PIM-SM with Distributed Anycast-RP Mode, each of the VTEPs must be the RP in the overlay network for their respective groups. The rendezvous points in the underlay network must be configured on the spine switches. All the VTEPs do not need to be BGP peers. There can be BGP peering between the VTEPs and the spine switches with the spine switches acting as route reflectors.

When a VTEP discovers a source device, it sends Source A-D Routes (MVPN Route Type 5) to all the other VTEPs. Based on these Source A-D routes, the other VTEPs send (S,G) join requests as MVPN route type 7 to the source VTEP.

Figure 2: PIM-SM with Distributed Anycast-RP Mode



1. IGMP Join for (*,G) from Receiver Device to VTEP 3.
2. Data Traffic from Source Device to VTEP 1.
3. Source A-D Route for (S,G) from VTEP 1 to VTEP 2 and VTEP 3.
4. MVPN route type 7 from VTEP 3 to VTEP 1.
5. Data Traffic from VTEP 1 to VTEP 3.

In PIM-SM with Distributed Anycast-RP Mode, the following sequence of events occurs:

1. Receiver sends (*,G) IGMP Join to VTEP 3. Since VTEP 3 is an RP, (*,G) is created at VTEP 3.

2. The source device starts streaming data and (S,G) is created on VTEP 1.

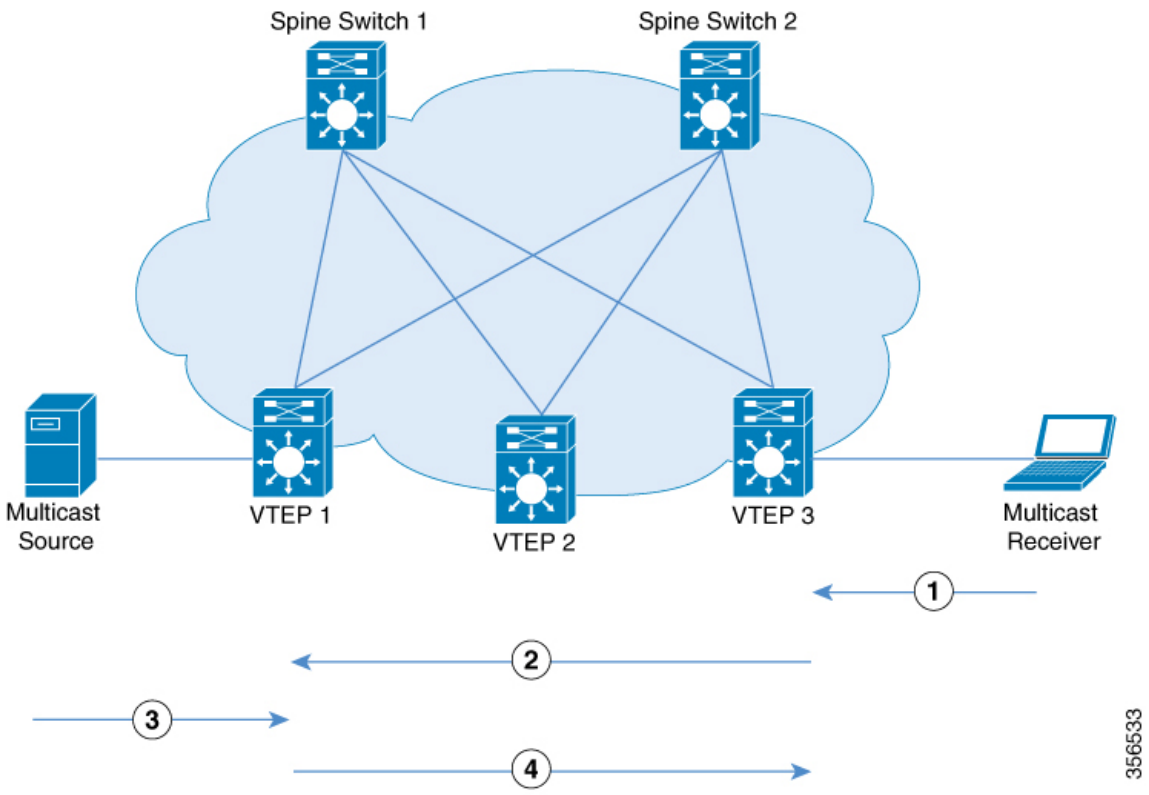
Note When PIM-SM with Distributed Anycast-RP Mode is enabled, the first packet is dropped.

3. VTEP 1 performs self-source-registration since it is also an RP.
4. The source VTEP (VTEP 1) advertises Source A-D Routes (also called MVPN route type 5) for (S,G) to all the other VTEPs which are BGP peers in the MVPN address family.
5. VTEP 2 and VTEP 3 receive and install the Source A-D Routes for (S,G).
6. (S,G) is created at VTEP 3. VTEP 3 now has an overlay route for (S,G) and also has a unicast route to the source device from the EVPN Control plane. It then sends an MVPN route type 7 (S,G) BGP join to VTEP 1 and starts accepting traffic.
7. VTEP 1 receives and installs MVPN route type 7 from VTEP 3. It uses the Layer 3 VNI's SVI as the forwarding interface for (S,G) and starts forwarding traffic.

PIM-SSM Mode

In PIM-SSM Mode, the Source A-D route (MVPN route type 5) is not needed for the multicast convergence to happen. The receiver VTEP does not wait to receive the Source A-D route to send the MVPN route type 7.

Figure 3: PIM-SSM Mode



1. IGMP Join for (S,G) from Receiver Device to VTEP 3.
2. MVPN route type 7.
3. Data Traffic for (S,G) from Source Device to VTEP 1.
4. Data Traffic from VTEP 1 to VTEP 3.

In PIM-SSM Mode, the following sequence of events occurs:

1. When the source device sends a unicast packet, VTEP 1 sends out EVPN routes to all the other VTEPs, letting them know that the packet is from the source device.
2. The receiver sends an (S,G) IGMP join towards VTEP 3 and an (S,G) entry is created.
3. VTEP 3 performs an RPF lookup for the source device. If the SVI of the Layer 3 VNI is found to be the RPF interface, VTEP 3 sends MVPN route type 7 towards VTEP 1.
4. VTEP 1 receives and installs the MVPN route type 7. VTEP 1 creates an (S,G) entry, using the Layer 3 VNI's SVI as the forwarding interface for (S,G).
5. The source device sends (S,G) data to VTEP 1 which starts forwarding the traffic to VTEP 3.

How to Configure Tenant Routed Multicast

Prerequisites to Configuring TRM

Before configuring TRM, ensure that BGP EVPN VXLAN Layer 2 and Layer 3 Overlay networks have been configured. Perform the following procedures to configure BGP EVPN VXLAN Layer 2 and Layer 3 Overlay networks:

- Configuring Layer 2 VPN EVPN on a VTEP.
- Configuring IP VRF on VTEP.
- Configuring Core-facing and Access-facing VLANs on a VTEP.
- Configuring Switch Virtual Interface for the Core-facing VLAN.
- Configuring Switch Virtual Interface for the Access-facing VLANs.
- Configuring the Loopback Interface on a VTEP.
- Configuring the NVE Interface on a VTEP.
- Configuring BGP with EVPN Address Family on VTEP.

See How to Configure EVPN VXLAN Integrated Routing and Bridging for detailed steps to configure Layer 2 and Layer 3 overlay networks.

Perform the following set of procedures to configure TRM:

- Configuring the Default Multicast Distribution Tree in the VRF, on page 6
- Configuring Multicast Routing on the Overlay VRF, on page 7
- Configuring Multicast on Switch Virtual Interfaces for the Core-facing and Access-facing VLANs, on page 8
- Configuring BGP with MVPN Address Family on VTEP, on page 9
- Configuring RP for Underlay Network , on page 10
- Configuring RP and SSM for Overlay Network, on page 10

Configuring the Default Multicast Distribution Tree in the VRF

To configure the default MDT for TRM, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**vrf definition** *vrf-name* **Example:** `Device(config)# vrf definition green`	Names the VRF and enters VRF configuration mode.
Step 4	**mdt default vxlan** *group-address* **Example:** `Device(config-vrf)# mdt default vxlan 225.2.2.2`	Configures the multicast group address range for data MDT groups for a VRF in a VXLAN. • This command creates a tunnel interface. • By default, the destination address of the tunnel header is the *group-address* argument.
Step 5	**mdt auto-discovery vxlan** **Example:** `Device(config-vrf)# mdt auto-discovery vxlan`	Enables VXLAN with BGP auto-discovery.
Step 6	**mdt overlay use-bgp spt-only** **Example:** `Device(config-vrf)# mdt overlay use-bgp spt-only`	Specifies BGP as the overlay protocol.
Step 7	**end** **Example:** `Device(config-vrf)# end`	Returns to privileged EXEC mode.

Configuring Multicast Routing on the Overlay VRF

To enable multicast routing on the overlay VRF, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**ip multicast-routing vrf** *vrf-name* **Example:** `Device(config)# ip multicast-routing vrf green`	Enables IP multicast forwarding on the overlay VRF.
Step 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring Multicast on Switch Virtual Interfaces for the Core-facing and Access-facing VLANs

To configure multicast on SVIs for the core-facing and access-facing VLANs on the VTEP, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface vlan** *core-facing-vlan-id* **Example:** `Device(config)# interface vlan 200`	Enters interface configuration mode for the specified VLAN.
Step 4	**ip pim sparse-mode** **Example:** `Device(config-if) # ip pim sparse-mode`	Enables multicast on the core-facing SVI.
Step 5	**exit** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.
Step 6	**interface vlan** *access-facing-vlan-id* **Example:** `Device(config)# interface vlan 202`	Enters interface configuration mode for the specified VLAN.

	Command or Action	Purpose
Step 7	**ip pim sparse-mode** **Example:** `Device(config-if) # ip pim sparse-mode`	Enables multicast on the access-facing SVI where sources or receivers are connected. Repeat this step for all the access-facing SVIs that are part of the Layer 2 VNI where sources and receivers are connected.
Step 8	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Configuring BGP with MVPN Address Family on VTEP

To configure BGP on a VTEP with MVPN address family, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router bgp** *autonomous-system-number* **Example:** `Device(config)# router bgp 1`	Enables a BGP routing process, assigns it an autonomous system number, and enters router configuration mode.
Step 4	**address-family ipv4 mvpn** **Example:** `Device(config-router)# address-family ipv4 mvpn`	Specifies the MVPN address family and enters address family configuration mode.
Step 5	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 10.2.2.20 activate`	Enables the exchange of information with a BGP neighbor. Use the IP address of the spine switch as the neighbor IP address.
Step 6	**neighbor** *ip-address* **send-community extended** **Example:** `Device(config-router-af)# neighbor 10.2.2.20 send-community both`	Specifies the communities attribute sent to a BGP neighbor. Use the IP address of the spine switch as the neighbor IP address.

	Command or Action	Purpose
Step 7	**neighbor** *ip-address* **advertisement-interval** *seconds* **Example:** `Device(config-router-af)# neighbor 10.2.2.20 advertisement-interval 10`	(Optional) Sets the minimum route advertisement interval (MRAI) between the sending of BGP routing updates.
Step 8	**exit-address-family** **Example:** `Device(config-router-af)# exit-address-family`	Exits address family configuration mode and returns to router configuration mode.
Step 9	**end** **Example:** `Device(config-router)# end`	Returns to privileged EXEC mode.

Configuring RP for Underlay Network

To configure RP for the underlay network, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ip pim rp-address** *ip-address-of-rp* **Example:** `Device(config)# ip pim rp-address <rp-ip-address>`	Configures the RP in the underlay network. For information about RP redundancy, see to *IP Multicast Routing Configuration Guide*.
Step 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring RP and SSM for Overlay Network

To configure RP and SSM for the overlay network, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *loopback-interface* **Example:** `Device(config)# interface Loopback 13`	Enters interface configuration mode for the specified Loopback interface.
Step 4	**vrf forwarding** *vrf-name* **Example:** `Device(config-if)# vrf forwarding green`	Configures forwarding table for the Loopback interface.
Step 5	**ip-address** *ip-address subnet-mask* **Example:** `Device(config-if)# ip address 10.1.13.13 255.255.255.255`	Configures the IP address for the Loopback interface.
Step 6	**ip pim sparse-mode** **Example:** `Device(config-if)# ip pim sparse-mode`	Enables PIM sparse mode on the Loopback interface. **Note** Enable PIM sparse mode only if EVPN VXLAN Layer 2 overlay network is also configured on the VTEP with underlay multicast as the mechanism for forwarding BUM traffic.
Step 7	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 8	**ip pim** [**vrf** *vrf-name*] **ssm** {**default** | **range** *access-list* } **Example:** `Device(config)# ip pim vrf green ssm default`	Configures an SSM range for TRM. The **default** keyword defines the SSM range access list as 232/8. The **range** keyword specifies the standard IP access list number or name that defines the SSM range.
Step 9	**ip pim vrf** *vrf-name* **rp-address** *loopback-address-of-vtep*	Configures the address of the loopback interface of the local VTEP as the PIM RP for

	Command or Action	Purpose
	Example: `Device(config)# ip pim vrf green rp-address 10.1.13.13`	the multicast group in PIM-SM with Distributed Anycast RP mode. **Note** The loopback interface specified must be part of the same VRF.
Step 10	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuration Examples for Tenant Routed Multicast

This section provides an example for TRM configuration. The following example shows a sample configuration for a VXLAN network with a receiver device and a source device connected to VTEP 1 and VTEP 2 respectively, with TRM enabled.

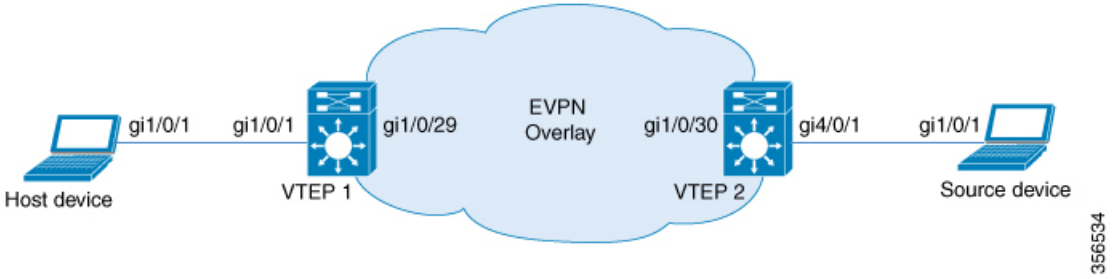


Table 1: Configuration Example for a VXLAN Network with the Source Device and Host Device connected to two VTEPs with TRM Enabled

VTEP 1	VTEP 2

VTEP 1	VTEP 2

VTEP1# **show running-config**
!
hostname VTEP1
!
vrf definition green
 rd 103:2
 !
 address-family ipv4
  mdt auto-discovery vxlan
  mdt default vxlan 239.1.1.1
  mdt overlay use-bgp spt-only
  route-target export 103:2
  route-target import 104:2
  route-target export 103:2 stitching
  route-target import 104:2 stitching
 exit-address-family
 !
!
ip routing
ip multicast-routing
ip multicast-routing vrf green
!
!
l2vpn evpn
 replication-type static
 router-id Loopback0
 default-gateway advertise
!
l2vpn evpn instance 1 vlan-based
 encapsulation vxlan
 route-target export 103:1
 route-target import 104:1
!
l2vpn evpn instance 2 vlan-based
 encapsulation vxlan
!
!
system mtu 9150
!
vlan configuration 200
 member vni 5000
vlan configuration 201
 member evpn-instance 1 vni 6000
vlan configuration 202
 member evpn-instance 2 vni 7000
!
!
interface Loopback0
 ip address 10.1.1.10 255.255.255.255
 ip pim sparse-mode
!
interface Loopback13
 vrf forwarding green
 ip address 10.1.13.13 255.255.255.0
 ip pim sparse-mode
 ipv6 enable
!
!
interface GigabitEthernet1/0/1
 description access interface
 switchport mode trunk
!
	VTEP2# **show running-config**
	!
	hostname VTEP2
	!
	vrf definition green
	 rd 104:2
	 !
	 address-family ipv4
	  mdt auto-discovery vxlan
	  mdt default vxlan 239.1.1.1
	  mdt overlay use-bgp spt-only
	  route-target export 104:2
	  route-target import 103:2
	  route-target export 104:2 stitching
	  route-target import 103:2 stitching
	 exit-address-family
	 !
	!
	ip routing
	ip multicast-routing
	ip multicast-routing vrf green
	!
	!
	l2vpn evpn
	 replication-type static
	 router-id Loopback0
	 default-gateway advertise
	!
	l2vpn evpn instance 1 vlan-based
	 encapsulation vxlan
	 route-target export 104:1
	 route-target import 103:1
	!
	l2vpn evpn instance 2 vlan-based
	 encapsulation vxlan
	!
	!
	system mtu 9150
	!
	vlan configuration 200
	 member vni 5000
	vlan configuration 201
	 member evpn-instance 1 vni 6000
	vlan configuration 202
	 member evpn-instance 2 vni 7000
	!
	!
	interface Loopback0
	 ip address 10.2.2.20 255.255.255.255
	 ip pim sparse-mode
	!
	interface Loopback14
	 vrf forwarding green
	 ip address 10.1.14.14 255.255.255.0
	 ip pim sparse-mode
	 ipv6 address 2001:200::14:14/128
	 ipv6 enable
	!
	interface GigabitEthernet4/0/1
	description access interface
	 switchport mode trunk
	!

VTEP 1	VTEP 2
interface GigabitEthernet1/0/29 description core-underlay-interface no switchport ip address 172.16.1.29 255.255.255.0 ip pim sparse-mode ! interface Vlan200 description core svi for l3vni vrf forwarding green ip unnumbered Loopback0 ip pim sparse-mode ipv6 enable no autostate ! interface Vlan201 description vni 6000 default-gateway vrf forwarding green ip address 192.168.1.201 255.255.255.0 ip pim sparse-mode ipv6 enable ! interface Vlan202 description vni 7000 default-gateway vrf forwarding green ip address 192.168.2.202 255.255.255.0 ip pim sparse-mode ! ! interface nve10 no ip address source-interface Loopback0 host-reachability protocol bgp member vni 6000 mcast-group 231.1.1.1 member vni 7000 mcast-group 231.1.1.1 member vni 5000 vrf green ! router ospf 1 router-id 10.1.1.10 network 10.1.1.0 0.0.0.255 area 0 network 172.16.1.0 0.0.0.255 area 0 ! router bgp 10 bgp router-id interface Loopback0 bgp log-neighbor-changes bgp update-delay 1 no bgp default ipv4-unicast neighbor 10.2.2.20 remote-as 10 neighbor 10.2.2.20 update-source Loopback0 ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 10.2.2.20 activate neighbor 10.2.2.20 send-community both exit-address-family ! address-family l2vpn evpn neighbor 10.2.2.20 activate neighbor 10.2.2.20 send-community both exit-address-family !	interface GigabitEthernet1/0/30 description core-underlay-interface no switchport ip address 172.16.1.30 255.255.255.0 ip pim sparse-mode ! interface Vlan200 description core svi for l3vni vrf forwarding green ip unnumbered Loopback0 ip pim sparse-mode ipv6 enable no autostate ! interface Vlan201 vrf forwarding green ip address 192.168.1.201 255.255.255.0 ip pim sparse-mode ipv6 address 2001:DB8:201::201/64 ipv6 enable ! interface Vlan202 description vni 7000 default-gateway vrf forwarding green ip address 192.168.2.202 255.255.255.0 ip pim sparse-mode ! ! interface nve10 no ip address source-interface Loopback0 host-reachability protocol bgp member vni 6000 mcast-group 231.1.1.1 member vni 7000 mcast-group 231.1.1.1 member vni 5000 vrf green ! router ospf 1 router-id 10.2.2.20 network 10.2.2.0 0.0.0.255 area 0 network 172.16.1.0 0.0.0.255 area 0 ! router bgp 10 bgp router-id interface Loopback0 bgp log-neighbor-changes bgp update-delay 1 no bgp default ipv4-unicast neighbor 10.1.1.10 remote-as 10 neighbor 10.1.1.10 update-source Loopback0 ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 10.1.1.10 activate neighbor 10.1.1.10 send-community both exit-address-family ! address-family l2vpn evpn neighbor 10.1.1.10 activate neighbor 10.1.1.10 send-community both exit-address-family !

VTEP 1	VTEP 2
address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ! ip pim rp-address 10.1.1.10 ip pim vrf green rp-address 10.1.13.13 ! ! end	address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ! ip pim rp-address 10.1.1.10 ip pim vrf green rp-address 10.1.14.14 ! ! end

The following examples provide outputs for **show** commands on VTEP 1 and VTEP 2 in the topology configured above.

- show nve peers, on page 16
- show l2vpn evpn peers vxlan, on page 17
- show ip igmp vrf green groups, on page 17
- show bgp ipv4 mvpn all, on page 17
- show ip mroute vrf green, on page 18
- show ip mfib vrf green, on page 19
- show ip mroute, on page 21
- show ip mfib, on page 22

show nve peers

VTEP 1

The following example shows the output for the **show nve peers** command on VTEP 1:

```
VTEP1# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve10      5000     L3CP 10.2.2.20        380e.4d9b.6a4a 5000       UP  A/-/4 03:22:40
nve10      6000     L2CP 10.2.2.20        14             6000       UP   N/A  03:22:19
nve10      7000     L2CP 10.2.2.20        6              7000       UP   N/A  03:22:19
```

VTEP 2

The following example shows the output for the **show nve peers** command on VTEP 2:

```
VTEP2# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve10      5000     L3CP 10.1.1.10        a0f8.4910.bce2 5000       UP  A/M/4 03:22:27
nve10      6000     L2CP 10.1.1.10        6              6000       UP   N/A  03:22:27
nve10      7000     L2CP 10.1.1.10        4              7000       UP   N/A  03:22:27
```

show l2vpn evpn peers vxlan

VTEP 1

The following example shows the output for the **show l2vpn evpn peers vxlan** command on VTEP 1:

```
VTEP1# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve10     6000     10.2.2.20               5          6000     01:34:50
nve10     7000     10.2.2.20               6          7000     01:34:50
```

VTEP 2

The following example shows the output for the **show l2vpn evpn peers vxlan** command on VTEP 2:

```
VTEP2# show l2vpn evpn peers vxlanInterface VNI      Peer-IP                   Num routes
eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve10     6000     10.1.1.10               7          6000     01:35:23
nve10     7000     10.1.1.10               6          7000     01:35:23
```

show ip igmp vrf green groups

VTEP 1

The following example shows the output for the **show ip igmp vrf green groups** command on VTEP 1:

```
VTEP1# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
229.1.1.1        Vlan201                  04:08:35  00:02:16  192.168.1.81
224.0.1.40       Loopback13               06:35:55  00:02:05  10.1.13.13
```

VTEP 2

The following example shows the output for the **show ip igmp vrf green groups** command on VTEP 2:

```
VTEP2# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
224.0.1.40       Loopback14               05:11:42  00:02:18  10.1.14.14
```

show bgp ipv4 mvpn all

VTEP 1

The following example shows the output for the **show bgp ipv4 mvpn all** command on VTEP 1:

```
VTEP1# show bgp ipv4 mvpn all
BGP table version is 22, local router ID is 10.1.1.10
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
     Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 103:2 (default for vrf green)
 *>i  [5][103:2][192.168.2.88][229.1.1.1]/18
                      10.2.2.20                0    100      0 ?
Route Distinguisher: 104:2
 *>i  [5][104:2][192.168.2.88][229.1.1.1]/18
                      10.2.2.20                0    100      0 ?
Route Distinguisher: 10.2.2.20:2
 *>   [7][10.2.2.20:2][10][192.168.2.88/32][229.1.1.1/32]/22
                      0.0.0.0                            32768 ?
```

VTEP 2

The following example shows the output for the **show bgp ipv4 mvpn all** command on VTEP 2:

```
VTEP2# show bgp ipv4 mvpn all
BGP table version is 24, local router ID is 10.2.2.20
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
     Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 104:2 (default for vrf green)
 *>   [5][104:2][192.168.2.88][229.1.1.1]/18
                      0.0.0.0                            32768 ?
 *>i  [7][104:2][10][192.168.2.88/32][229.1.1.1/32]/22
                      10.1.1.10                0    100      0 ?
Route Distinguisher: 10.2.2.20:2
 *>i  [7][10.2.2.20:2][10][192.168.2.88/32][229.1.1.1/32]/22
                      10.1.1.10                0    100      0 ?
```

show ip mroute vrf green

VTEP 1

The following example shows the output for the **show ip mroute vrf green** command on VTEP 1:

```
VTEP1# show ip mroute vrf greenIP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
```

```
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode
(*, 229.1.1.1), 04:11:11/stopped, RP 10.1.13.13, flags: SJC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan201, Forward/Sparse, 04:11:11/00:02:40
(192.168.2.88, 229.1.1.1), 00:02:42/00:00:17, flags: gQ
  Incoming interface: Vlan200, RPF nbr 10.2.2.20
  Outgoing interface list:
    Vlan201, Forward/Sparse, 00:02:42/00:02:40
(*, 224.0.1.40), 04:44:21/00:02:34, RP 10.1.13.13, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback13, Forward/Sparse, 04:44:21/00:02:34
```

VTEP 2

The following example shows the output for the **show ip mroute vrf green** command on VTEP 2:

```
VTEP2# show ip mroute vrf green
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode
(*, 229.1.1.1), 00:53:58/stopped, RP 10.1.14.14, flags: SPF
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null
(192.168.2.88, 229.1.1.1), 00:53:58/00:01:56, flags: FTGqx
  Incoming interface: Vlan202, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan200, Forward/Sparse, 00:03:06/stopped
(*, 224.0.1.40), 04:46:21/00:02:48, RP 10.1.14.14, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback14, Forward/Sparse, 04:46:21/00:02:48
```

show ip mfib vrf green

VTEP 1

The following example shows the output for the **show ip mfib vrf green** command on VTEP 1:

```
VTEP1# show ip mfib vrf green
Entry Flags:    C - Directly Connected, S - Signal, IA - Inherit A flag,
                ET - Data Rate Exceeds Threshold, K - Keepalive
```

```
                DDE - Data Driven Event, HW - Hardware Installed
                ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                MS  - MoFRR  Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
 (*,224.0.0.0/4) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,224.0.1.40) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel9 Flags: A
   Loopback13 Flags: F IC NS
     Pkts: 0/0/0 Rate: 0 pps
 (*,229.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel9 Flags: A
   Vlan201 Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
 (192.168.2.88,229.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   117/0/126/0, Other: 0/0/0
   Tunnel9 Flags: A
   Vlan200, VXLAN Decap Flags: NS
   Vlan201 Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
```

VTEP 2

The following example shows the output for the **show ip mfib vrf green** command on VTEP 2:

```
VTEP2# show ip mfib vrf green
Entry Flags:    C - Directly Connected, S - Signal, IA - Inherit A flag,
                ET - Data Rate Exceeds Threshold, K - Keepalive
                DDE - Data Driven Event, HW - Hardware Installed
                ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                MS  - MoFRR  Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
 (*,224.0.0.0/4) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,224.0.1.40) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
```

```
   Tunnel5 Flags: A
   Loopback14 Flags: F IC NS
     Pkts: 0/0/0 Rate: 0 pps
 (*,229.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel5 Flags: A
 (192.168.2.88,229.1.1.1) Flags: HW
   SW Forwarding: 56/0/100/0, Other: 1715/1699/16
   HW Forwarding:   2306/0/122/0, Other: 0/0/0
   Vlan202 Flags: A
   Vlan200, VXLAN v4 Encap (5000, 239.1.1.1) Flags: F
     Pkts: 0/0/0 Rate: 0 pps
```

show ip mroute

VTEP 1

The following example shows the output for the **show ip mroute** command on VTEP 1:

```
VTEP1# show ip mroute
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode
(*, 239.1.1.1), 00:57:25/00:03:16, RP 10.1.1.10, flags: SJCx
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/29, Forward/Sparse, 00:57:17/00:03:16
    Tunnel0, Forward/Sparse, 00:57:25/stopped
(10.2.2.20, 239.1.1.1), 00:04:25/00:02:37, flags: Tx
  Incoming interface: GigabitEthernet1/0/29, RPF nbr 172.16.1.30
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:04:25/00:01:33
(*, 231.1.1.1), 00:57:25/00:03:02, RP 10.1.1.10, flags: SJCFx
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/29, Forward/Sparse, 00:56:28/00:03:02
    Tunnel0, Forward/Sparse, 00:57:25/stopped
(10.2.2.20, 231.1.1.1), 00:56:26/00:02:55, flags: JTx
  Incoming interface: GigabitEthernet1/0/29, RPF nbr 172.16.1.30
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:56:26/00:00:33
(10.1.1.10, 231.1.1.1), 00:57:23/00:03:03, flags: FTx
  Incoming interface: Loopback0, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/29, Forward/Sparse, 00:56:53/00:03:02
(*, 224.0.1.40), 00:57:25/00:02:46, RP 10.1.1.10, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
```

```
  Outgoing interface list:
    GigabitEthernet1/0/29, Forward/Sparse, 00:56:43/00:02:46
    Loopback0, Forward/Sparse, 00:57:25/00:02:44
```

VTEP 2

The following example shows the output for the **show ip mroute** command on VTEP 2:

```
VTEP2# show ip mroute
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode
(*, 239.1.1.1), 04:50:56/stopped, RP 10.1.1.10, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/30, RPF nbr 172.16.1.29
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:50:56/00:02:03
(10.2.2.20, 239.1.1.1), 00:04:51/00:02:44, flags: FTx
  Incoming interface: Loopback0, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/30, Forward/Sparse, 00:04:49/00:02:37
(*, 231.1.1.1), 00:58:51/stopped, RP 10.1.1.10, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/30, RPF nbr 172.16.1.29
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:58:51/00:01:08
(10.1.1.10, 231.1.1.1), 00:58:16/00:01:05, flags: JTx
  Incoming interface: GigabitEthernet1/0/30, RPF nbr 172.16.1.29
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:58:16/00:01:43
(10.2.2.20, 231.1.1.1), 00:58:49/00:02:58, flags: FTx
  Incoming interface: Loopback0, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/30, Forward/Sparse, 00:58:49/00:02:46
(*, 224.0.1.40), 05:14:59/00:02:03, RP 10.1.1.10, flags: SJCL
  Incoming interface: GigabitEthernet1/0/30, RPF nbr 172.16.1.29
  Outgoing interface list:
    Loopback0, Forward/Sparse, 05:14:58/00:02:03
```

show ip mfib

VTEP 1

The following example shows the output for the **show ip mfib** command on VTEP 1:

```
VTEP1# show ip mfib
Entry Flags:    C - Directly Connected, S - Signal, IA - Inherit A flag,
                ET - Data Rate Exceeds Threshold, K - Keepalive
```

```
                DDE - Data Driven Event, HW - Hardware Installed
                ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                MS  - MoFRR  Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
 (*,224.0.0.0/4) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,224.0.1.40) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel8 Flags: A
   GigabitEthernet1/0/29 Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0 Rate: 0 pps
 (*,231.1.1.1) Flags: C HW
   SW Forwarding: 1/0/206/0, Other: 4/4/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel8 Flags: A
   GigabitEthernet1/0/29 Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
 (10.1.1.10,231.1.1.1) Flags: HW
   SW Forwarding: 1/0/128/0, Other: 0/0/0
   HW Forwarding:   192/0/144/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/29 Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
 (10.2.2.20,231.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   386/0/186/0, Other: 0/0/0
   GigabitEthernet1/0/29 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 26/0/150/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel8 Flags: A
   GigabitEthernet1/0/29 Flags: F NS
     Pkts: 0/0/22 Rate: 0 pps
 (10.2.2.20,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   162/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/29 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1 Rate: 0 pps
```

VTEP 2

The following example shows the output for the **show ip mfib** command on VTEP 2:

```
VTEP2# show ip mfib
Entry Flags:    C - Directly Connected, S - Signal, IA - Inherit A flag,
                ET - Data Rate Exceeds Threshold, K - Keepalive
```

```
                DDE - Data Driven Event, HW - Hardware Installed
                ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                MS  - MoFRR  Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
 (*,224.0.0.0/4) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,224.0.1.40) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   GigabitEthernet1/0/30 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0 Rate: 0 pps
 (*,231.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/146/0, Other: 0/0/0
   GigabitEthernet1/0/30 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
 (10.1.1.10,231.1.1.1) Flags: HW
   SW Forwarding: 1/0/128/0, Other: 0/0/0
   HW Forwarding:   192/0/156/0, Other: 0/0/0
   GigabitEthernet1/0/30 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1 Rate: 0 pps
 (10.2.2.20,231.1.1.1) Flags: HW
   SW Forwarding: 3/0/194/0, Other: 1/1/0
   HW Forwarding:   397/0/174/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/30 Flags: F NS
     Pkts: 0/0/2 Rate: 0 pps
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   GigabitEthernet1/0/30 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0 Rate: 0 pps
 (10.2.2.20,239.1.1.1) Flags: HW
   SW Forwarding: 3/0/150/0, Other: 1/1/0
   HW Forwarding:   160/0/156/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/30 Flags: F NS
     Pkts: 0/0/2 Rate: 0 pps
```

Verifying Tenant Routed Multicast

The following table lists the **show** commands that are used to verify TRM:

Command	Purpose
show nve peers	Displays NVE interface state information for peer leaf switches.
show l2vpn evpn peers vxlan	Displays Layer 2 EVPN peer route counts in the VXLAN and up time.
show ip igmp vrf green groups	Displays the multicast groups with receivers that are directly connected to the router pertaining to the specific Multicast Virtual Routing and Forwarding (MVRF) instance and that were learned through IGMP.
show bgp ipv4 mvpn all	Displays the MVPN options for BGP MVPN C-route signaling.
show ip mroute vrf green	Displays the contents of the mroute table that pertain to a specific MVRF instance.
show ip mfib vrf green	Displays forwarding entries and interfaces in the IPv4 Multicast Forwarding Information Base (MFIB) associated with MVRF instances.
show ip mroute	Displays multicast routing table information.
show ip mfib	Displays the forwarding entries and interfaces in the IPv4 MFIB.