Configuring Tenant Routed Multicast

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Restrictions for Tenant Routed Multicast

- Data MDT between BGP EVPN VXLAN TRM and external MVPN multicast network is not supported.
- In the underlay network, the default MDT supports only PIM sparse mode, and Data MDT supports PIM sparse mode and PIM source specific multicast (SSM) mode.

Note The spine switch can be configured as the rendezvous point (RP). The RP for the underlay network can also be elected using PIM Bootstrap Router (BSR) or Auto-RP or Static.

- TRM data MDT is supported for TRM in PIM sparse mode and TRM in PIM source specific mode for IPv4 connections only.
- TRM data MDT supports IPv4 C-multicast flows only.
- TRM data MDT supports rate-based switchover only for IPv4 multicast flows.
- TRM data MDT supports Layer 2, IP, and VRF-Lite handoffs only.

Information about Tenant Routed Multicast

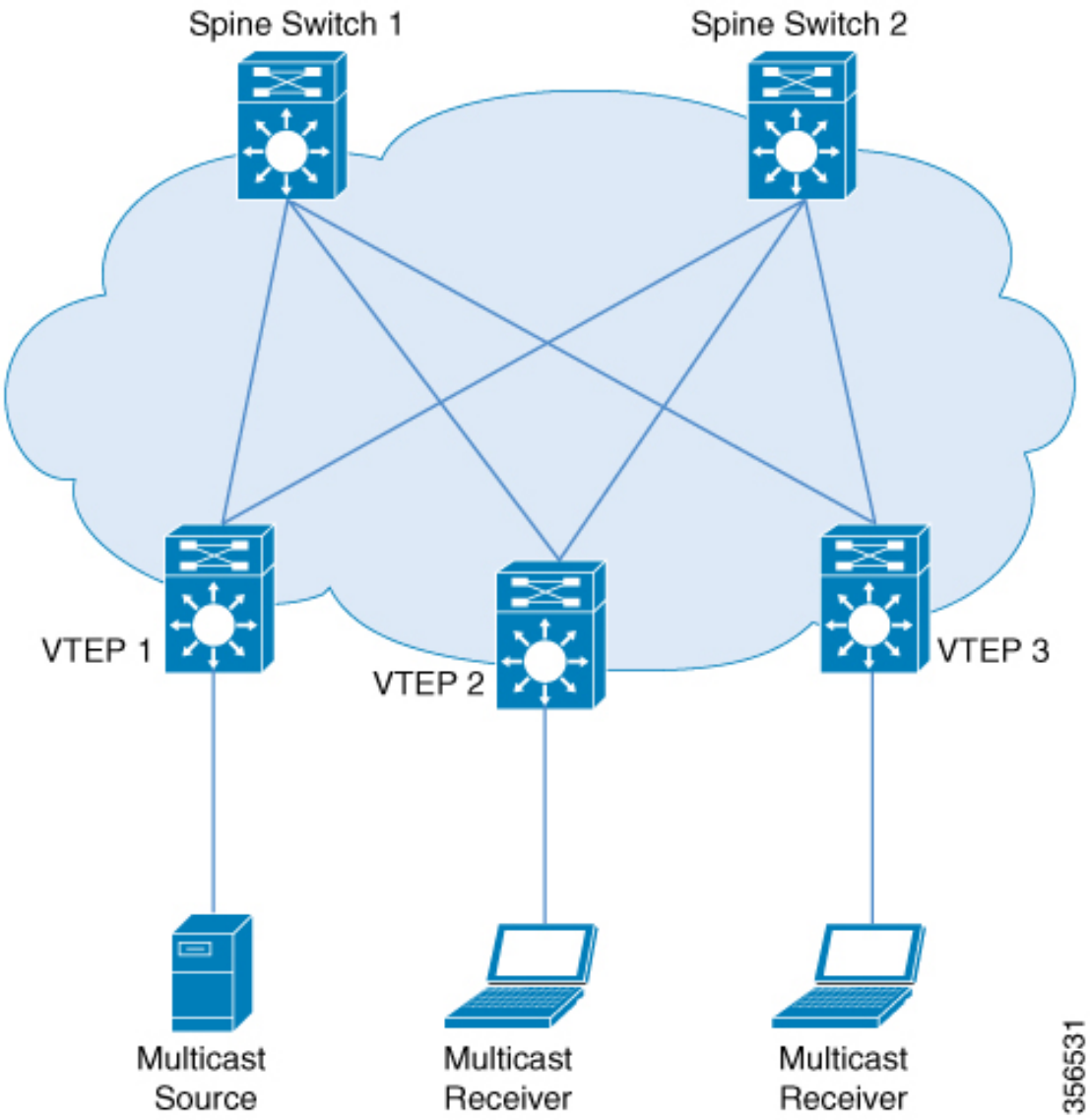
TRM enables multicast forwarding in a VXLAN fabric that uses a BGP-based EVPN control plane. TRM provides multi-tenancy aware multicast forwarding between senders and receivers within the same or different subnets local or across VTEPs.

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 in 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. Thus, TRM allows a seamless integration with existing multicast networks with newer enterprise fabric.

Figure 1: Tenant Routed Multicast Topology



For IPv4 and IPv6 multicast traffic, TRM uses BGP EVPN and multicast virtual private network (MVPN) routes to perform multicast routing. All the VTEPs in the network 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. Source reachability is distributed via EVPN route type 2 and EVPN route type 5 in the fabric. RPF is installed based on these routes. Source-active and receiver-join information is carried in the MVPN address family using route types 5, 6, and 7.

In an EVPN VXLAN network, TRM is supported in the overlay network in PIM sparse mode and PIM source specific multicast (SSM) mode. VTEPs have BGP peering in MVPN as well as EVPN address families to exchange routes for TRM.

TRM in PIM Sparse Mode

PIM-SM distributes information about active sources by forwarding data packets on the shared tree. Because PIM-SM uses shared trees, it requires the use of a rendezvous point (RP). An RP is used for the initial convergence of multicast traffic between sources and receivers.

The following section describes the different ways the RP can be configured for TRM in PIM sparse mode.

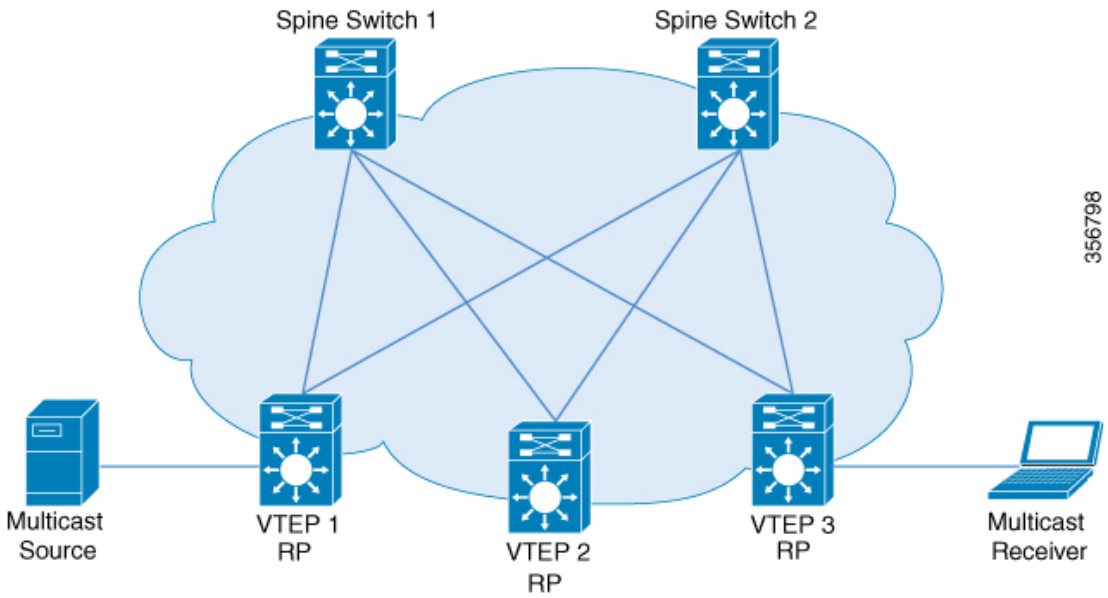
RP Placement

For TRM in PIM sparse mode, the overlay RP can be configured either within the BGP EVPN VXLAN fabric, or outside of the fabric.

Anycast RP in the Overlay Network

In Anycast RP in the overlay network, every VTEP acts as an RP.

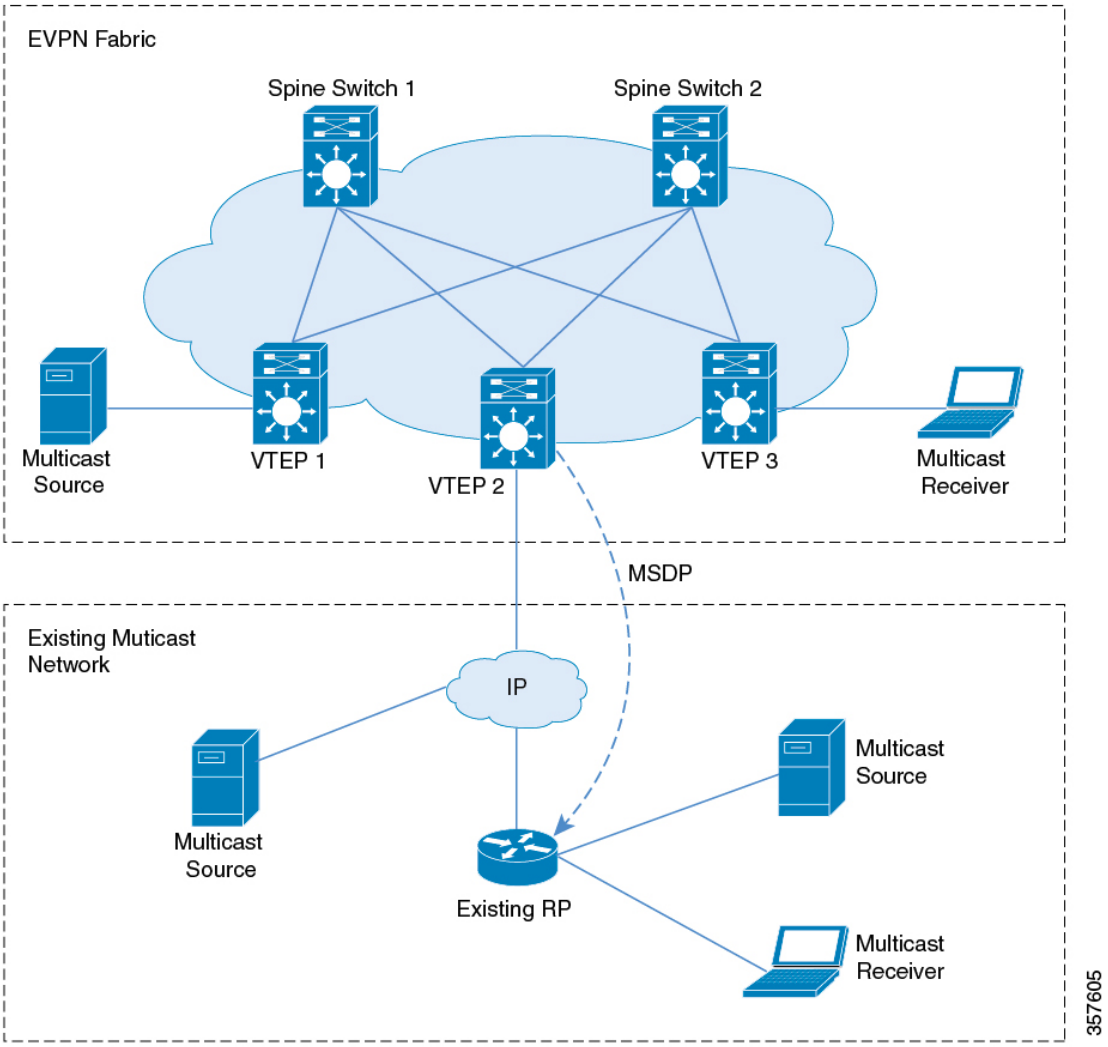
Figure 2: Anycast RP in the Overlay Network



Anycast RP can also inter-operate with existing multicast networks and RP as shown below. Refer the *Configuring MSDP* chapter of the *IP Multicast Routing Configuration Guide* for information on how to configure MSDP.

Note MSDP is an IPv4 protocol and the MSDP originator IP loopback configuration is mandatory.

Figure 3: Anycast RP with IPv4 Overlay in an Existing Multicast Network



RP Inside the BGP EVPN VXLAN Fabric

In a TRM scenario where all sources and receivers are within the EVPN VXLAN network, the overlay RP can be placed on a border spine or on a VTEP.

Figure 4: Border Spine Switch as an RP

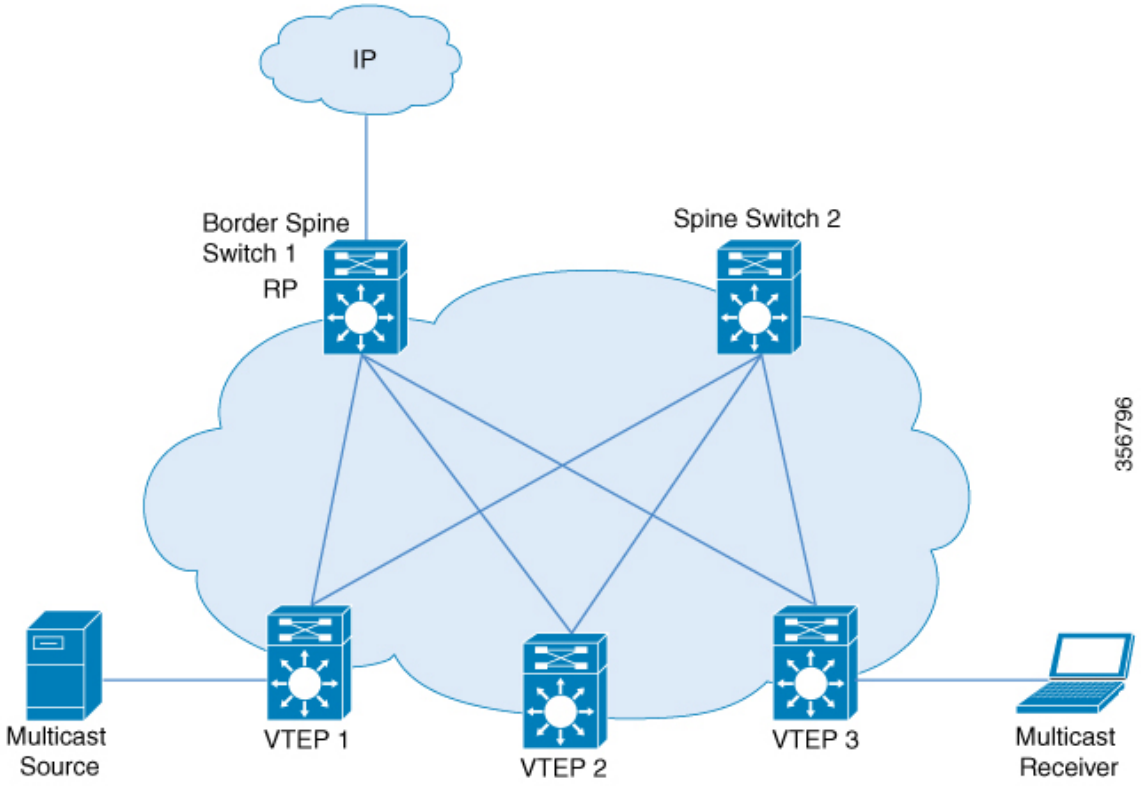
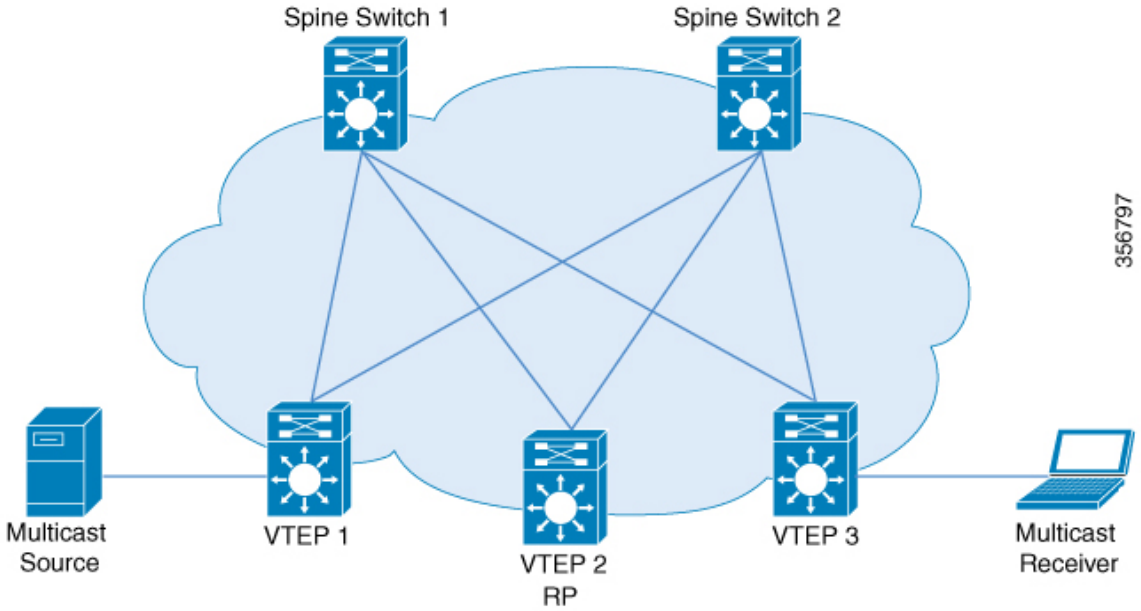


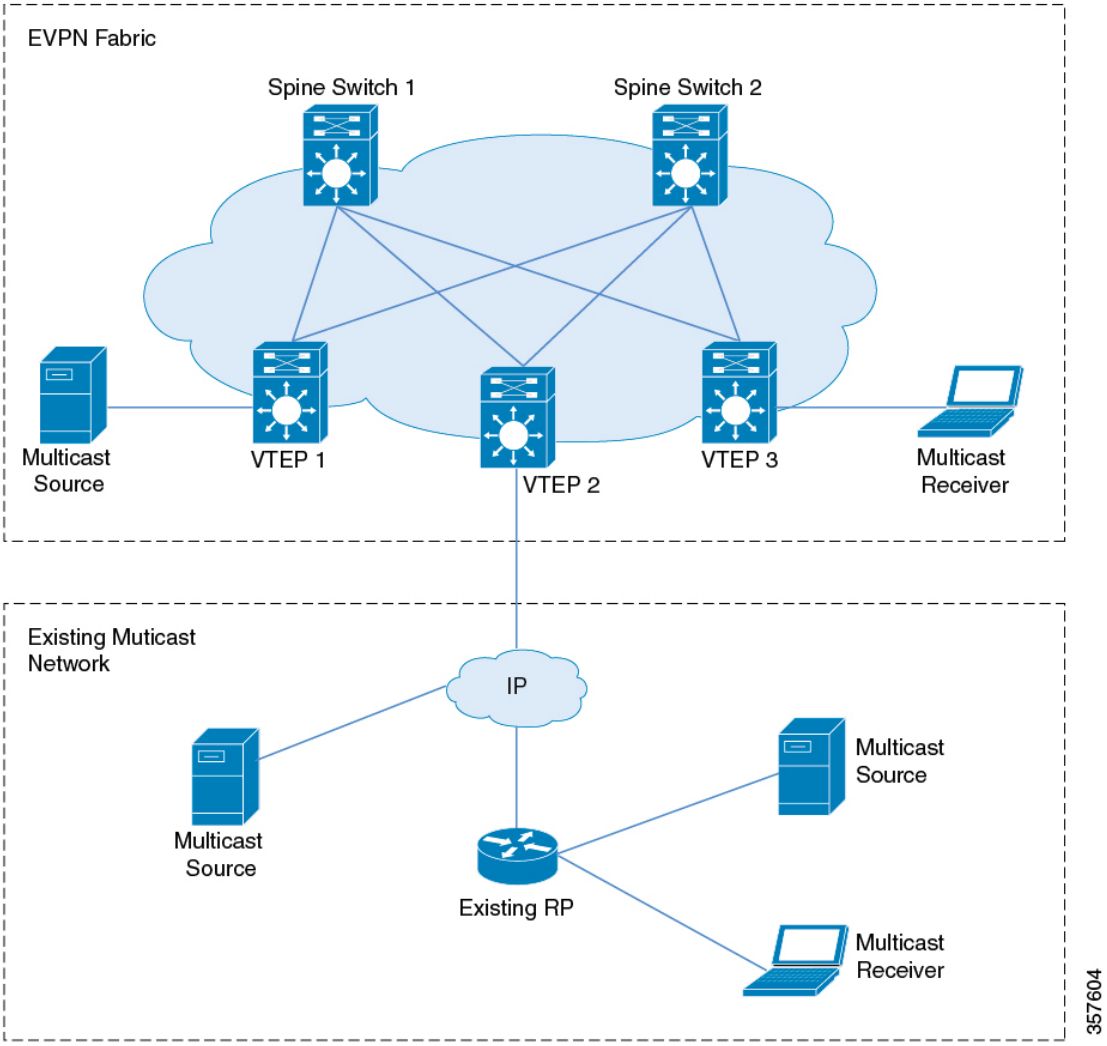
Figure 5: VTEP as an RP



RP Outside the BGP EVPN VXLAN Fabric

In a TRM scenario where sources and receivers need to interwork with the overlay network and the EVPN VXLAN network, the RP can be placed on an external router connected to a VTEP.

Figure 6: RP Outside the BGP EVPN VXLAN Fabric with an Existing Multicast Network



In PIM sparse mode, TRM can be configured in three different ways depending on how the RP is configured:

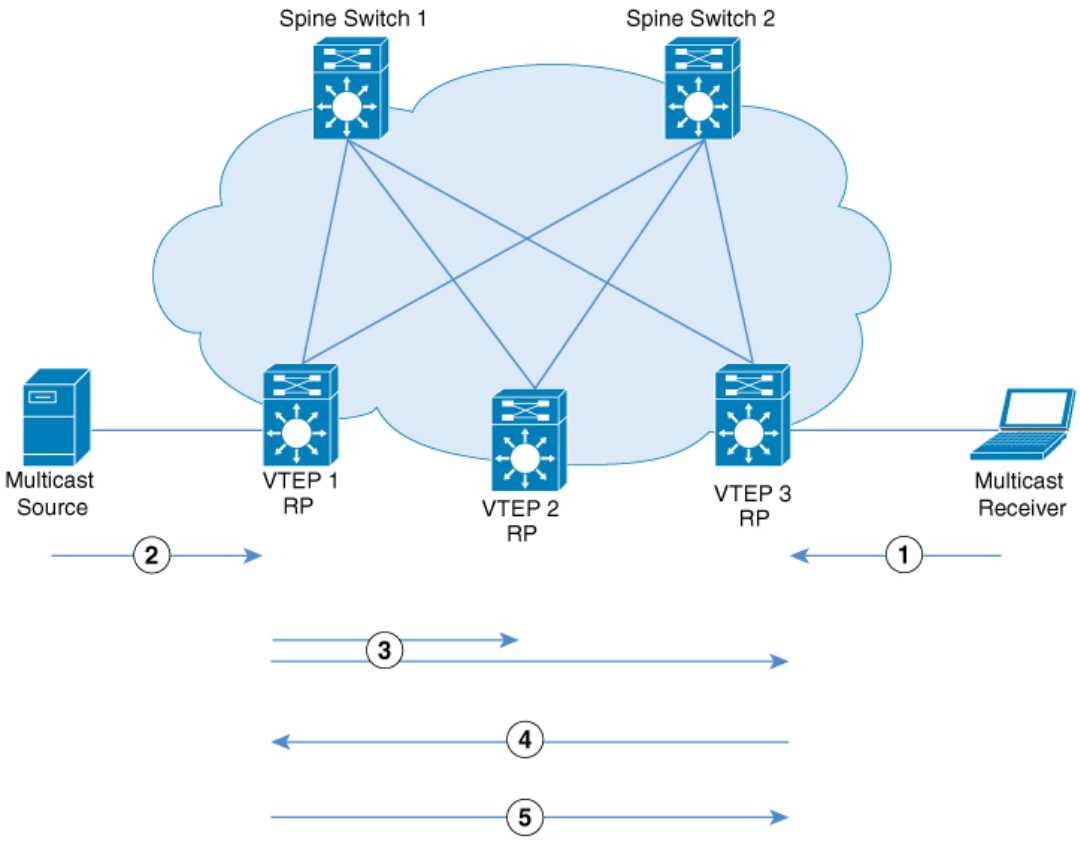
- PIM Sparse Mode with Anycast RP
- PIM Sparse Mode with RP Inside the BGP EVPN VXLAN Fabric
- PIM Sparse Mode with RP Outside the BGP EVPN VXLAN Fabric

PIM Sparse Mode with Anycast RP

In PIM sparse mode with anycast RP, every VTEP in the EVPN VXLAN network acts as an RP in the overlay network for its respective multicast group. The RPs in the underlay network must be configured on the spine switches.

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 7: PIM Sparse Mode with Anycast RP



In PIM sparse mode with anycast RP, 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.
3. VTEP 1 performs self-source-registration since it is also an RP.

   The source VTEP (VTEP 1) advertises Source A-D Routes (also called MVPN route type 5) for the (S,G) to all the other VTEPs which are BGP peers in the MVPN address family.
4. VTEP 2 and VTEP 3 receive and install the Source A-D Route for the (S,G).

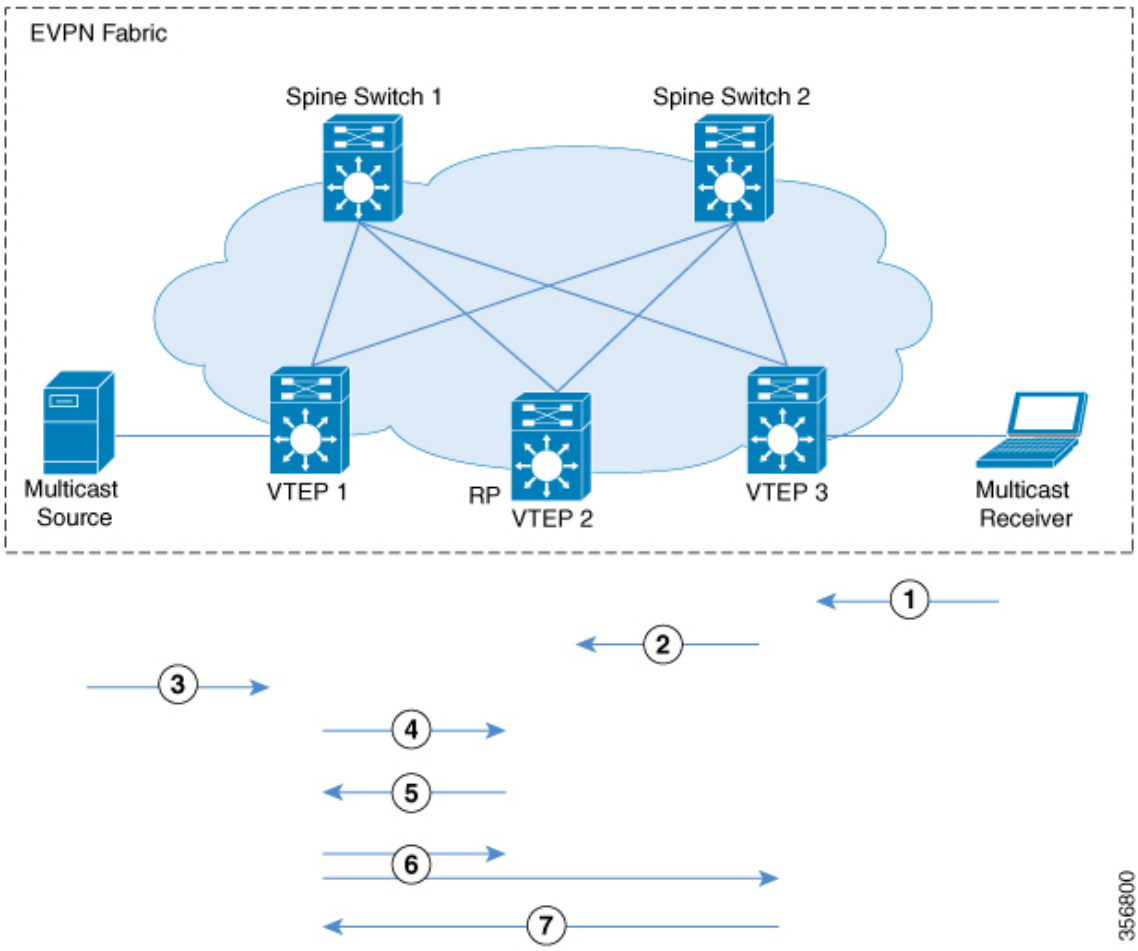
   (S,G) is created at VTEP 3. VTEP 3 now has an overlay route for the (S,G) and also has a unicast route to the source device from the EVPN Control plane. It then sends an MVPN route type 7 (S,G) BGP join to VTEP 1 and starts accepting traffic.

5. 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 the (S,G) and starts forwarding traffic.

PIM Sparse Mode with RP Inside the BGP EVPN VXLAN Fabric

In PIM sparse mode with RP inside the BGP EVPN VXLAN Fabric, the RP can be any VTEP in the EVPN VXLAN network.

Figure 8: PIM Sparse Mode with RP Inside the BGP EVPN VXLAN Fabric



The following sequence of events occurs when TRM is enabled in PIM sparse mode with the RP inside the fabric:

1. Receiver sends (*,G) IGMP Join to VTEP 3. (*,G) is created at VTEP 3.
2. VTEP 3 sends MVPN route type 6 to VTEP 2 which is the RP. (*,G) is created at VTEP 2.
3. The source device starts streaming data and (S,G) is created on VTEP 1.
4. VTEP 1 performs source-registration at VTEP 2 since it is the RP. (S,G) is created at VTEP 2.
5. Since the RP has a receiver for (S,G), it sends an MVPN route type 7 to VTEP 1 and forwards PIM-register traffic towards receivers in the (*,G) tree.

6. VTEP 1 receives and installs MVPN route type 7 from VTEP 2. It uses the Layer 3 VNI's SVI as the forwarding interface for (S,G).

   The source VTEP (VTEP 1) advertises Source A-D Routes for (S,G) to all the other VTEPs which are BGP peers in the MVPN address family.

   VTEP 2 and VTEP 3 receive and install the Source A-D Routes for (S,G).

7. (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 to VTEP 1 and starts accepting traffic.

   VTEP 1 receives and installs MVPN route type 7 from VTEP 3 and starts forwarding traffic.

Note For the receiver VTEP to be able to send an MVPN route type 7 to the source VTEP, there can be two triggers:

- The (*,G) packets being forwarded to the receiver VTEP from the RP.
- The Source A-D route received from the source VTEP.

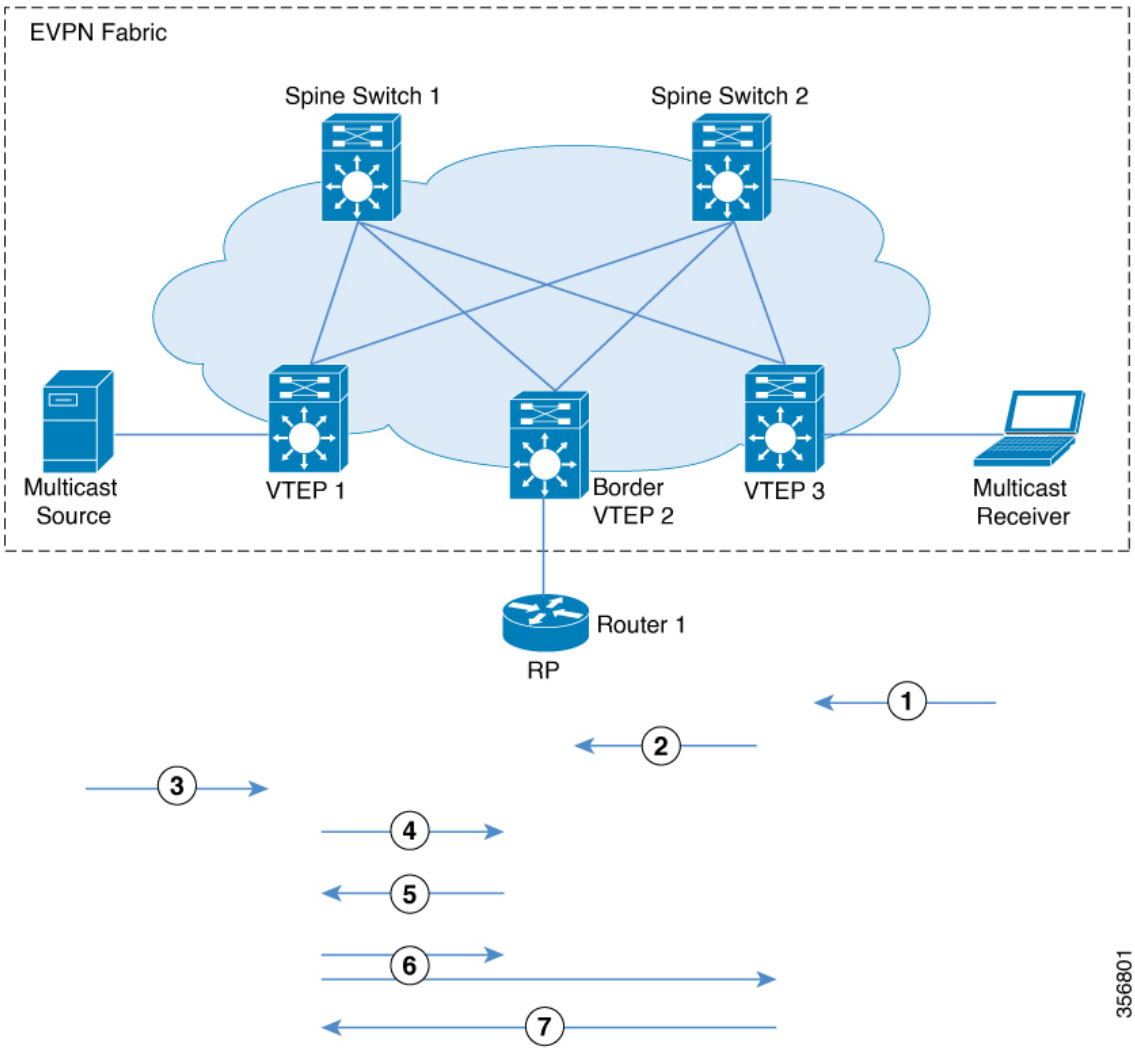
Once either of these are received, the receiver VTEP sends MVPN route type 7 to the source VTEP.

PIM Sparse Mode with RP Outside the BGP EVPN VXLAN Fabric

In PIM sparse mode with RP outside the BGP EVPN VXLAN Fabric, the RP can be a PIM router behind any VTEP in the EVPN VXLAN network.

Note When the RP is configured outside the BGP EVPN VXLAN fabric, TRM in PIM sparse mode functions the same way as it does when the RP is inside the fabric.

Figure 9: PIM Sparse Mode with RP Outside the BGP EVPN VXLAN Fabric



The chronological traffic flow from the image above is as follows:

1. Receiver sends (*,G) IGMP Join to VTEP 3. (*,G) is created at VTEP 3.
2. VTEP3 sends and MVPN route type 6 to VTEP 2 which has the RP in its overlay network. This route is converted to a (*,G) join towards the RP by VTEP2.
3. The source device starts streaming data and (S,G) is created on VTEP 1.
4. VTEP1 performs source registration with RP. (S,G) join from RP creates (S,G) state at VTEP 2.
5. Since the RP has a receiver for (S,G), it sends an MVPN route type 7 to VTEP 1 and forwards PIM-register traffic towards receivers in the (*,G) tree.
6. VTEP 1 receives and installs MVPN route type 7 from VTEP 2. It uses the Layer 3 VNI's SVI as the forwarding interface for (S,G).

   The source VTEP (VTEP 1) advertises Source A-D Routes for (S,G) to all the other VTEPs which are BGP peers in the MVPN address family.

VTEP 2 and VTEP 3 receive and install the Source A-D Routes for (S,G).

7. (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 to VTEP 1 and starts accepting traffic.

   VTEP 1 receives and installs MVPN route type 7 from VTEP 3 and starts forwarding traffic.

Note For the receiver VTEP to be able to send an MVPN route type 7 to the source VTEP, there can be two triggers:

- The (*,G) packets being forwarded to the receiver VTEP from the RP.
- The Source A-D route received from the source VTEP.

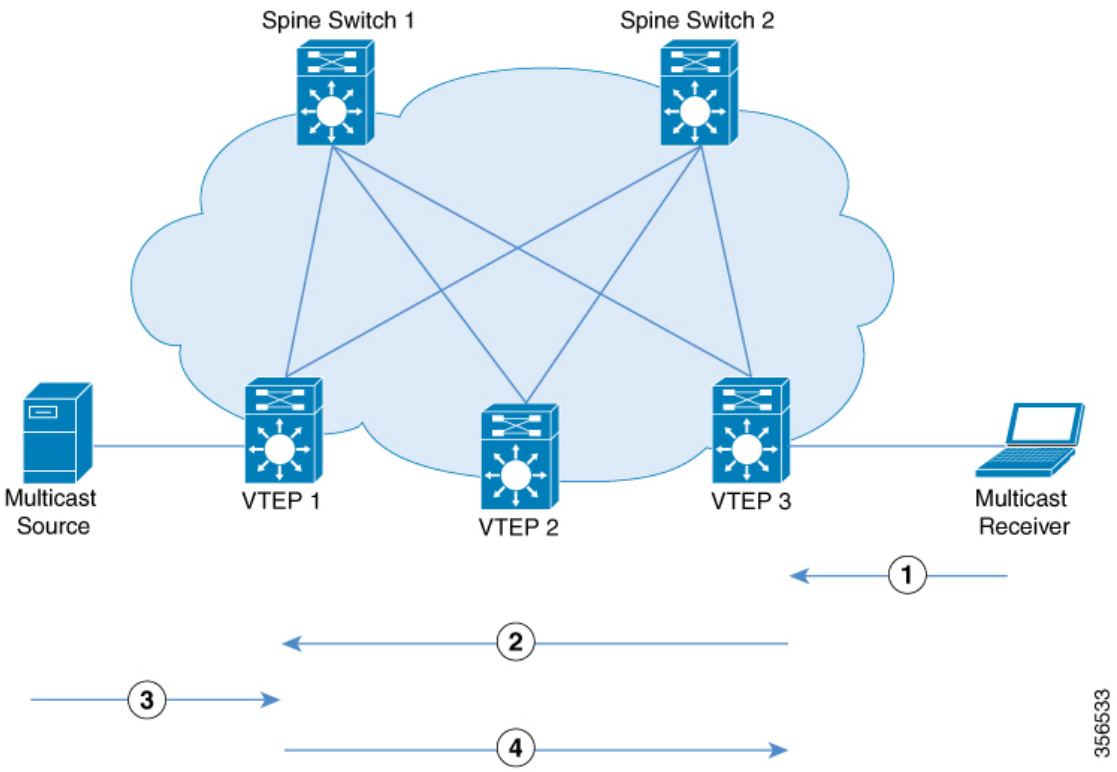
Once either of these are received, the receiver VTEP sends MVPN route type 7 to the source VTEP.

See PIM Sparse mode with RP located inside the BGP EVPN VXLAN fabric for the sequence of events that happen when TRM is enabled in PIM sparse mode with the RP inside the fabric.

TRM in PIM Source Specific Mode

In PIM source specific 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 10: PIM Source Specific Mode



In PIM Source Specific 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.

   The receiver sends an (S,G) IGMP join towards VTEP 3 and an (S,G) entry is created.

2. 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.

3. 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).

   The source device sends (S,G) data to VTEP 1.

4. VTEP 1 starts forwarding the traffic to VTEP 3.

Data MDT

Data MDTs are purpose built underlay MDTs to provide optimized forwarding in the MVPN and EVPN core. Threshold and access control configurations can be used to control the characteristics of overlay streams for which data MDTs will be built. The threshold at which the data MDT is created can be configured on a per-VRF basis only. When the multicast transmission exceeds the defined threshold, the sending VTEP device creates the data MDT and sends a MVPN route type 3 message, which contains information about the data MDT, to all devices on the default MDT. The statistics to determine whether a multicast stream has exceeded

the data MDT threshold are examined periodically. After a VTEP device sends the MVPN route type 3 message, it waits 3 more seconds before switching over.

Benefits of Data MDT

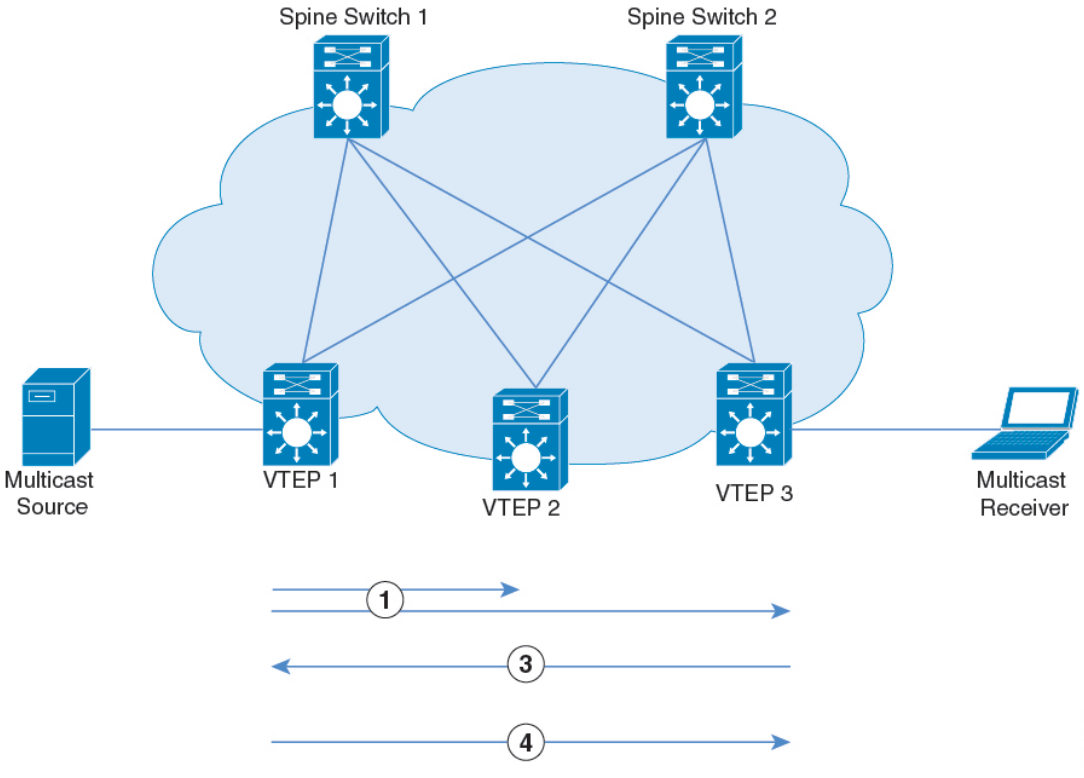
- With Data MDT, replication load on the EVPN spine nodes are greatly reduced and there are less number of copies in the EVPN underlay overall.
- Data MDT lowers the bandwidth usage between the spine nodes and VTEPs. The traffic load at VTEPs that do not require certain overlay streams are completely avoided.
- Data MDT also offers flexibility in deployment through ACLs and threshold-based switchovers, and also enables load-balancing capabilities.

Data MDTs are created only for (S, G) multicast route entries within the VRF multicast routing table. They are not created for (*, G) entries regardless of the value of the individual source data rate. An ACL can be configured to control the overlay streams that will be allowed onto the data MDT irrespective of the threshold.

Data MDT is supported for all TRM modes: PIM sparse mode with anycast RP, PIM sparse mode with RP inside the BGP EVPN VXLAN fabric, PIM sparse mode with RP outside the BGP EVPN VXLAN fabric, and PIM source specific multicast (SSM) mode.

Note For an optimal usage of Data MDT, we recommend that you configure PIM-SSM in the underlay. If you configure PIM sparse mode in the underlay, use distinct Data MDT ranges on each VTEP.

Figure 11: Data MDT Mode



After the sequence of events of PIM sparse mode with RP outside the BGP EVPN VXLAN fabric or PIM source specific mode is completed, continue with the following sequence of events for Data MDT mode:

1. VTEP1 sends MVPN route type 3 to all other nodes. The threshold is exceeded for stream and MVPN route type 3 is sent to advertise data MDT for the stream. After 3 seconds, VTEP1 switches stream from the default MDT to data MDT using MVPN route type 3. Only VTEP3 receives stream data.
2. VTEP2 has no receiver, and so it does not join the advertised data MDT underlay.
3. VTEP3 has a receiver, and joins the advertised data MDT underlay.

How to Configure Tenant Routed Multicast

- Configuring Tenant Routed Multicast (TRM), on page 15

  Configuring TRM using CLI provides concise steps to configure TRM.

- Configuring Tenant Routed Multicast (TRM) Advanced Mode, on page 17

  Configuring TRM using advanced mode provides detail steps with extra customisation.

To configure TRM, you can use any one of the above mentioned methods.

Prerequisites to Configuring TRM

Before configuring TRM, ensure that EVPN VXLAN Layer 2 and Layer 3 Overlay networks have been configured. See How to Configure EVPN VXLAN Integrated Routing and Bridging for detailed steps to configure Layer 2 and Layer 3 overlay networks.

Configuring Tenant Routed Multicast (TRM)

For quick TRM MDT setup, 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	**vrf rd-auto** **Example:** `Device# vrf rd-auto`	Configures auto route distinguisher (RD) for all the VRFs.
Step 4	**vrf definition** *vrf-name* **Example:** `Device(config)# vrf definition green`	Names the VRF and enters VRF configuration mode.
Step 5	**vnid** *vnid-number* **evpn-instance vni** *l3vni-number* **core vlan** *core vlan number* **Example:** `Device(config-vrf)# vnid 30500 evpn-instance vni 50000 core-vlan 500`	Creates core VLAN and VNIs for the VRF.
Step 6	**address-family** {**ipv4** | **ipv6** } **Example:** `Device(config-vrf)# address-family ipv4`	Specifies the VRF and enters VRF address family configuration mode. • Use the **ipv4** keyword to configure IPv4 address family. • Use the **ipv6** keyword to configure IPv6 address family.
Step 7	**evpn-mcast** *group-address* **data** *group-address* **anycast** *group-address* **Example:**	Creates a default MDT address. Data MDT group and anycast RP are optional parameters. • Use the **data** option to setup Data mdt.

	Command or Action	Purpose
	`Device(config-vrf-af)# evpn-mcast 225.2.2.2 data 232.0.0.0 0.0.0.128 anycast 5.5.5.5`	• Use the **anycast** option to setup TRM in Distributed Anycast-RP (spt-only) mode. Please refer to the corresponding section in Configuring Tenant Routed Multicast (TRM) Advanced Mode, on page 17
Step 8	**exit-address-family** **Example:** `Device(config-vrf-af)# exit-address-family`	Exits VRF address family configuration mode and returns to configuration mode.
Step 9	**mdt data threshold** *kb/s* **Example:** `Device(config-vrf-af)# mdt data threshold 111`	(Optional) Defines the bandwidth threshold value in kilobits per second (kb/s). The range is from 1 to 4294967, and the default value is 0.
Step 10	**ip pim vrf** *vrf-name* **register-source** *source-address* **Example:** `Device(config)# ip pim vrf BLUE register-source Lo11`	Configures IPv4 PIM register source for the VRF in case of external RP
Step 11	**ipv6 pim vrf** *vrf-name* **register-source** *source-address* **Example:** `Device(config)# ipv6 pim vrf BLUE register-source Lo11`	Configures IPv6 PIM register source for the VRF in case of external RP
Step 12	**ip pim vrf** *vrf-name* **rp-address** *rp-address* **Example:** `Device(config)# ip pim vrf BLUE register-source Lo11`	Configures IPv4 PIM RP address for the VRF in case of external RP
Step 13	**ipv6 pim vrf** *vrf-name* **rp-address** *rp-address* **Example:** `Device(config)# ipv6 pim vrf BLUE register-source Lo11`	Configures IPv6 PIM RP address for the VRF in case of external RP
Step 14	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring Tenant Routed Multicast (TRM) Advanced Mode

Use this method if you wish to customise TRM configuration, for configuration without customisation refer to Configuring Tenant Routed Multicast (TRM), on page 15.

Perform the following set of procedures to configure TRM in an EVPN VXLAN network with customisation:

Configuring TRM with PIM Sparse Mode

To configure TRM with PIM Sparse Mode, perform the following tasks:

Configuring the TRM Multicast Distribution Tree in the VRF

To configure the TRM MDT, 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	**vrf definition** *vrf-name* **Example:** `Device(config)# vrf definition green`	Names the VRF and enters VRF configuration mode.
Step 4	**address-family** {**ipv4** | **ipv6** } **Example:** `Device(config-vrf)# address-family ipv4`	Specifies the VRF and enters VRF address family configuration mode. • Use the **ipv4** keyword to configure IPv4 address family. • Use the **ipv6** keyword to configure IPv6 address family.
Step 5	**mdt default vxlan** *group-address* **Example:** `Device(config-vrf-af)# mdt default vxlan 225.2.2.2`	Configures the multicast group address range for default MDT groups for a VRF in a VXLAN.
Step 6	**mdt auto-discovery vxlan** [**inter-as**] **Example:** `Device(config-vrf-af)# mdt auto-discovery vxlan`	Enables VXLAN with BGP auto-discovery. Use the **inter-as** keyword for the MVPN address family routes to cross the BGP autonomous system (AS) boundaries.

	Command or Action	Purpose
Step 7	**mdt overlay use-bgp** [**spt-only**] **Example:** `Device(config-vrf-af)# mdt overlay use-bgp spt-only`	Configures the mechanism that is used by TRM in PIM sparse mode to operate within the BGP EVPN VXLAN fabric. Specifies BGP as the overlay protocol. • Use the **mdt overlay use-bgp spt-only** command to configure PIM sparse mode with anycast RP. • Use the **mdt overlay use-bgp** command to configure PIM sparse mode with a single RP either inside or outside the BGP EVPN VXLAN fabric.
Step 8	**mdt data vxlan** *data-mdt-subnet data-mdt-mask* [**list** *access-list-number*] **Example:** `Device(config-vrf-af)# mdt data vxlan 225.2.2.0 0.0.0.255 list 101`	(Optional) Configures the multicast group address range for data MDT groups for a VRF in a VXLAN.
Step 9	**mdt data threshold** *kb/s* **Example:** `Device(config-vrf-af)# mdt data threshold 111`	(Optional) Defines the bandwidth threshold value in kilobits per second (kb/s). The range is from 1 to 4294967, and the default value is 0.
Step 10	**exit-address-family** **Example:** `Device(config-vrf-af)# exit-address-family`	Exits VRF address family configuration mode and returns to VRF configuration mode.
Step 11	**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.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
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	**ipv6 unicast-routing** **Example:** `Device(config)# ipv6 unicast-routing`	Enables IPv6 unicast forwarding.
Step 5	**ipv6 multicast-routing vrf** *vrf-name* **Example:** `Device(config)# ipv6 multicast-routing vrf green`	Enables IPv6 multicast forwarding on the overlay VRF.
Step 6	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring Multicast on Switch Virtual Interfaces for 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:**	Enables IPv4 multicast on the core-facing SVI.

	Command or Action	Purpose
	`Device(config-if) # ip pim sparse-mode`	
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.
Step 7	**ip pim sparse-mode** **Example:** `Device(config-if) # ip pim sparse-mode`	Enables IPv4 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** | **ipv6** } **mvpn** **Example:** `Device(config-router)# address-family ipv4 mvpn`	Specifies the MVPN address family and enters address family configuration mode. • Use the **ipv4** keyword to configure IPv4 MVPN address family. • Use the **ipv6** keyword to configure IPv6 MVPN address family.

	Command or Action	Purpose
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.
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:

Note We recommend that you configure the Spine Switch as the RP for the underlay network.

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 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 *IP Multicast Routing Configuration Guide*.
Step 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring RP for Overlay Network

To configure RP 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 IPv4 multicast 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.

	Command or Action	Purpose
Step 7	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 8	{**ip** | **ipv6** } **pim vrf** *vrf-name* **rp-address** *rp-address* **Example:** `Device(config)# ip pim vrf green rp-address 10.1.13.13`	Configures the address of the local VTEP as the PIM RP for the multicast group. • In PIM-SM with Anycast RP mode, use the address of the loopback interface of the local VTEP. • In PIM-SM with RP either inside or outside the BGP EVPN VXLAN fabric, use the IP address of the RP. **Note** The loopback interface specified must be part of the same VRF.
Step 9	{**ip** | **ipv6** } **pim vrf** *vrf-name* **register-source** *loopback-address-of-vtep* **Example:** `Device(config)# ip pim vrf green register-source loopback901`	Configures a unique IP address for the loopback interface of the VTEP that acts as the first hop router to multicast traffic.
Step 10	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring TRM with PIM Source Specific Mode

To configure TRM with PIM Source Specific Mode, perform the following tasks:

- Configure the TRM Multicast Distribution Tree in the VRF
- Configure Multicast Routing on the Overlay VRF
- Configure Multicast on Switch Virtual Interfaces for the Core-facing and Access-facing VLANs
- Configure BGP with MVPN Address Family on VTEP
- Configuring RP for Underlay Network

Configuring SSM for Overlay Network

To configure 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	**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 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

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.

Command	Purpose
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.

Configuration Examples for Tenant Routed Multicast

The following sections provide configuration examples for TRM in different scenarios.

Note These configuration examples do not have the Data MDT feature enabled.

Example: Configuring TRM Using CLI

This example shows how to configure and verify TRM using CLI.

Figure 12: Tenant Routed Multicast Topology

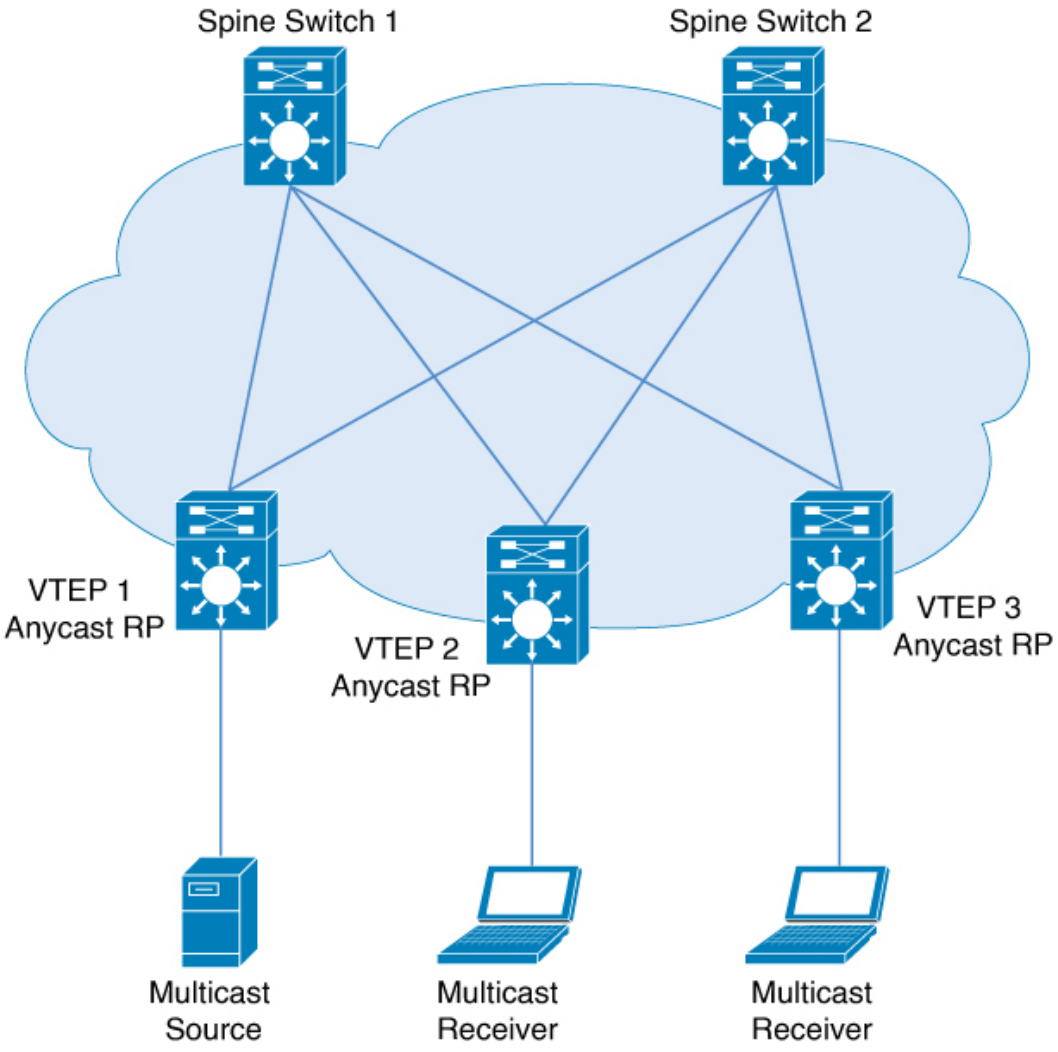


Table 1: Configuring VTEP 1, VTEP 2, and VTEP 3 to Configure TRM

VTEP 1	VTEP 2	VTEP 3

VTEP 1	VTEP 2	VTEP 3
vrf definition red rd 1002:1 vpn id 10:1 vnid 5050 evpn-instance vni 50000 core-vlan 501 route-target export 10:1 route-target import 10:1 ! address-family ipv4 evpn-mcast 225.25.25.25 anycast 61.61.1.11 route-target export 10:1 route-target import 10:1 route-target export 10:1 stitching route-target import 10:1 stitching exit-address-family ! address-family ipv6 evpn-mcast 225.25.25.25 anycast 6600::1 route-target export 10:1 route-target import 10:1 route-target export 10:1 stitching route-target import 10:1 stitching exit-address-family ! l2vpn evpn profile test_underlayv4 l2vni-base 10000 replication-type static 225.1.1.1 ! interface Loopback0 ip address 1.1.1.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address 2000::1:1/128 ipv6 enable ipv6 ospf 10 area 2 ! interface Loopback1 vrf forwarding red ip address 11.11.11.11 255.255.255.255 ip pim sparse-mode ipv6 address 1111::1/128 ipv6 enable ! interface Port-channel5 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 hold-queue 4094 in hold-queue 4094 out ! interface Port-channel6 no switchport ip address 10.10.10.1 255.255.255.0	vrf definition red rd 1001:1 vpn id 10:1 vnid 5050 evpn-instance vni 50000 core-vlan 501 route-target export 10:1 route-target import 10:1 ! address-family ipv4 evpn-mcast 225.25.25.25 anycast 70.1.1.1 route-target export 10:1 route-target import 10:1 route-target export 10:1 stitching route-target import 10:1 stitching exit-address-family ! address-family ipv6 evpn-mcast 225.25.25.25 anycast 7700::1 route-target export 10:1 route-target import 10:1 route-target export 10:1 stitching route-target import 10:1 stitching exit-address-family ! l2vpn evpn profile test_underlayv4 l2vni-base 10000 replication-type static 225.1.1.1 ! vlan configuration 100 member evpn-instance profile test_underlayv4 ! ! ! interface Loopback0 ip address 2.2.2.2 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address 2000::2:2/128 ipv6 enable ipv6 ospf 10 area 2 ! interface Loopback1 vrf forwarding red ip address 22.22.22.22 255.255.255.255 ip pim sparse-mode ipv6 address 2222::2/128 ipv6 enable ! interface Loopback100 ip address 133.133.133.133 255.255.255.255 ip pim sparse-mode	vrf definition red rd 1002:1 vpn id 10:1 vnid 5050 evpn-instance vni 50000 core-vlan 501 ! address-family ipv4 evpn-mcast 225.25.25.25 anycast 9.9.9.9 route-target export 10:1 route-target import 10:1 route-target export 10:1 stitching route-target import 10:1 stitching exit-address-family ! address-family ipv6 evpn-mcast 225.25.25.25 anycast 9999::9 route-target export 10:1 route-target import 10:1 route-target export 10:1 stitching route-target import 10:1 stitching exit-address-family ! l2vpn evpn profile test_underlayv4 l2vni-base 10000 replication-type static 225.1.1.1 ! ! vlan configuration 100 member evpn-instance profile test_underlayv4 ! ! interface Loopback0 ip address 3.3.3.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address 2000::3:3/128 ipv6 enable ipv6 ospf 10 area 2 ! ! interface FiftyGigE1/0/45 no switchport ip address 49.2.2.1 255.255.255.0 no ip redirects no ip unreachables no ip proxy-arp ip pim sparse-mode ip ospf 1 area 0 load-interval 30 carrier-delay msec 0 ipv6 address 2200:19::1/64 ipv6 enable ipv6 ospf 10 area 2

VTEP 1	VTEP 2	VTEP 3
no ip redirects no ip unreachables no ip proxy-arp ip pim sparse-mode ip ospf 1 area 0 load-interval 30 carrier-delay msec 0 ipv6 address 2000:10::1/64 ipv6 enable ipv6 ospf 10 area 2 hold-queue 4094 in hold-queue 4094 out ! interface Port-channel61 no switchport ip address 14.14.14.1 255.255.255.0 no ip redirects no ip unreachables no ip proxy-arp ip pim sparse-mode ip ospf 1 area 0 load-interval 30 carrier-delay msec 0 ipv6 address 2000:4::10:1/64 ipv6 enable ipv6 ospf 10 area 2 hold-queue 4094 in hold-queue 4094 out ! interface TenGigabitEthernet1/1/1 no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 6 mode active hold-queue 4094 in hold-queue 4094 out ! interface TenGigabitEthernet1/1/2 no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 61 mode active hold-queue 4094 in hold-queue 4094 out ! interface TenGigabitEthernet1/1/3 ! interface TenGigabitEthernet1/1/4 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 channel-group 5 mode active hold-queue 4094 in hold-queue 4094 out ! interface TenGigabitEthernet2/1/1	ip ospf 1 area 0 ipv6 address 1331::1/128 ipv6 enable ! interface Port-channel5 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 hold-queue 4094 in hold-queue 4094 out ! interface Port-channel6 no switchport no ip address ! interface Port-channel7 no switchport ip address 40.40.40.1 255.255.255.0 no ip redirects no ip unreachables no ip proxy-arp ip pim sparse-mode ip ospf 1 area 0 load-interval 30 carrier-delay msec 0 ipv6 address 2000:44::1/64 ipv6 enable ipv6 ospf 10 area 2 hold-queue 4094 in hold-queue 4094 out ! interface Port-channel71 no switchport ip address 44.44.44.1 255.255.255.0 no ip redirects no ip unreachables no ip proxy-arp ip pim sparse-mode ip ospf 1 area 0 load-interval 30 carrier-delay msec 0 ipv6 address 2000:1::44:1/64 ipv6 enable ipv6 ospf 10 area 2 hold-queue 4094 in hold-queue 4094 out ! interface TwentyFiveGigE1/0/7 no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 7 mode active hold-queue 4094 in hold-queue 4094 out ! interface TwentyFiveGigE1/0/11 no switchport	hold-queue 4094 in hold-queue 4094 out ! interface FiftyGigE1/0/46 no switchport ip address 49.1.1.1 255.255.255.0 no ip redirects no ip unreachables no ip proxy-arp ip pim sparse-mode ip ospf 1 area 0 load-interval 30 carrier-delay msec 0 ipv6 address 2000:19::1/64 ipv6 enable ipv6 ospf 10 area 2 hold-queue 4094 in hold-queue 4094 out ! interface FiftyGigE1/0/47 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 hold-queue 4094 in hold-queue 4094 out ! ! interface Vlan100 vrf forwarding red ip address 20.20.20.1 255.255.255.0 ip pim dr-priority 3 ip pim sparse-mode ip igmp version 3 load-interval 30 carrier-delay msec 0 ipv6 address 2020::1/64 ipv6 enable hold-queue 4094 in hold-queue 4094 out ! ! interface nve1 no ip address ip pim sparse-mode source-interface Loopback0 host-reachability protocol bgp ! router ospf 1 nsr nsf timers throttle spf 10 100 5000 timers throttle lsa 10 100 5000 timers lsa arrival 80 ! router bgp 1111 bgp router-id 3.3.3.3 bgp log-neighbor-changes bgp graceful-restart bgp sso route-refresh-enable

VTEP 1	VTEP 2	VTEP 3
no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 6 mode active hold-queue 4094 in hold-queue 4094 out ! interface TenGigabitEthernet2/1/2 no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 61 mode active hold-queue 4094 in hold-queue 4094 out ! interface TenGigabitEthernet2/1/4 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 channel-group 5 mode active hold-queue 4094 in hold-queue 4094 out ! interface Vlan100 vrf forwarding red ip address 20.20.20.1 255.255.255.0 ip pim dr-priority 3 ip pim sparse-mode ip igmp version 3 load-interval 30 carrier-delay msec 0 ipv6 address 2020::1/64 ipv6 enable hold-queue 4094 in hold-queue 4094 out ! interface nve1 no ip address ip pim sparse-mode source-interface Loopback0 host-reachability protocol bgp ! router ospf 1 nsr nsf timers throttle spf 10 100 5000 timers throttle lsa 10 100 5000 timers lsa arrival 80 ! router bgp 1111 bgp router-id 1.1.1.1 bgp log-neighbor-changes bgp update-delay 1 bgp graceful-restart bgp sso route-refresh-enable no bgp default ipv4-unicast neighbor 2.2.2.2 remote-as 1111	no ip address load-interval 30 carrier-delay msec 0 channel-group 71 mode active hold-queue 4094 in hold-queue 4094 out ! interface TwentyFiveGigE1/0/16 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 channel-group 5 mode active hold-queue 4094 in hold-queue 4094 out ! interface TwentyFiveGigE1/0/19 switchport trunk allowed vlan 100 switchport mode trunk ! interface TwentyFiveGigE2/0/5 switchport trunk allowed vlan 100-200 switchport mode trunk load-interval 30 carrier-delay msec 0 channel-group 5 mode active hold-queue 4094 in hold-queue 4094 out ! interface TwentyFiveGigE2/0/19 no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 7 mode active hold-queue 4094 in hold-queue 4094 out ! interface TwentyFiveGigE2/0/20 no switchport no ip address load-interval 30 carrier-delay msec 0 channel-group 71 mode active hold-queue 4094 in hold-queue 4094 out ! interface Vlan100 vrf forwarding red ip address 20.20.20.1 255.255.255.0 ip pim dr-priority 3 ip pim sparse-mode ip igmp version 3 load-interval 30 carrier-delay msec 0 ipv6 address 2020::1/64 ipv6 enable hold-queue 4094 in hold-queue 4094 out	no bgp default ipv4-unicast neighbor 1.1.1.1 remote-as 1111 neighbor 1.1.1.1 update-source Loopback0 neighbor 2.2.2.2 remote-as 1111 neighbor 2.2.2.2 update-source Loopback0 ! address-family ipv4 mvpn neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both neighbor 5.5.5.5 activate neighbor 5.5.5.5 send-community both exit-address-family ! address-family l2vpn evpn bgp nexthop trigger delay 0 rewrite-evpn-rt-asn neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both neighbor 5.5.5.5 activate neighbor 5.5.5.5 send-community both exit-address-family ! address-family ipv4 vrf red advertise l2vpn evpn redistribute connected neighbor 1.1.1.1 remote-as 1111 neighbor 1.1.1.1 ha-mode graceful-restart neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both neighbor 2.2.2.2 remote-as 1111 neighbor 2.2.2.2 ha-mode graceful-restart neighbor 2.2.2.2 activate exit-address-family ! ! ip pim rp-address 15.15.15.15 ip pim vrf red register-source Loopback1

VTEP 1	VTEP 2	VTEP 3
neighbor 2.2.2.2 update-source Loopback0 ! address-family ipv4 mvpn neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both neighbor 2.2.2.2 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both neighbor 2.2.2.2 route-reflector-client exit-address-family ! address-family l2vpn evpn bgp nexthop trigger delay 0 rewrite-evpn-rt-asn neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both neighbor 2.2.2.2 route-reflector-client exit-address-family ! address-family ipv4 vrf red advertise l2vpn evpn redistribute connected neighbor 2.2.2.2 remote-as 1111 neighbor 2.2.2.2 ha-mode graceful-restart neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both exit-address-family ! address-family ipv6 vrf red redistribute connected advertise l2vpn evpn neighbor 2.2.2.2 remote-as 1111 neighbor 2.2.2.2 ha-mode graceful-restart neighbor 2.2.2.2 activate neighbor 2.2.2.2 send-community both exit-address-family ! ip pim rp-address 15.15.15.15 ip pim vrf red register-source Loopback1 ip pim vrf red ssm default ! ipv6 router ospf 10 nsr ! !	! interface nve1 no ip address ip pim sparse-mode source-interface Loopback0 host-reachability protocol bgp ! interface nve6 no ip address ip pim sparse-mode source-interface Loopback100 host-reachability protocol bgp member vni 60000 vrf green member vni 20000 mcast-group 226.66.66.66 ! router ospf 1 nsr nsf timers throttle spf 10 100 5000 timers throttle lsa 10 100 5000 timers lsa arrival 80 ! router bgp 1111 bgp router-id 2.2.2.2 bgp log-neighbor-changes bgp update-delay 1 bgp graceful-restart bgp sso route-refresh-enable no bgp default ipv4-unicast neighbor 1.1.1.1 remote-as 1111 neighbor 1.1.1.1 update-source Loopback0 neighbor 3.3.3.3 remote-as 1111 neighbor 3.3.3.3 update-source Loopback0 neighbor 5.5.5.5 remote-as 1111 neighbor 5.5.5.5 update-source Loopback0 ! address-family ipv4 mvpn neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both exit-address-family ! address-family l2vpn evpn bgp nexthop trigger delay 0 rewrite-evpn-rt-asn neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both exit-address-family ! address-family ipv4 vrf red advertise l2vpn evpn	

VTEP 1	VTEP 2	VTEP 3
	redistribute connected neighbor 1.1.1.1 remote-as 1111 neighbor 1.1.1.1 ha-mode graceful-restart neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both exit-address-family ! address-family ipv6 vrf red redistribute connected advertise l2vpn evpn neighbor 1.1.1.1 remote-as 1111 neighbor 1.1.1.1 ha-mode graceful-restart neighbor 1.1.1.1 activate neighbor 1.1.1.1 send-community both exit-address-family ! address-family ipv4 vrf red-1 advertise l2vpn evpn redistribute connected exit-address-family ! address-family ipv6 vrf red-1 redistribute connected advertise l2vpn evpn exit-address-family ! ip pim rp-address 15.15.15.15 ip pim vrf red register-source Loopback1	

Outputs to Verify the Configuration on VTEP 1

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

```
VTEP1# show ip mroute vrf red 239.1.1.1 v

(*, 239.1.1.1), 22:26:06/stopped, RP 9.9.9.9, flags: SPF
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(20.20.20.23, 239.1.1.1), 22:26:06/00:01:19, flags: FTGqx
  Incoming interface: Vlan100, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan501, VXLAN v4 Encap: (50000, 225.25.25.25), Forward/Sparse, 20:17:53/stopped, Pkts:0,
 flags:

VTEP1#
```

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

```
VTEP1# show ip mfib vrf red 239.1.1.1 v

(*,239.1.1.1) Flags: C K HW
   0x3D  OIF-IC count: 0, OIF-A count: 1
   SW Forwarding: 0/0/0/0, Other: 145404227/145404227/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel26 Flags: RA A MA NP
 (20.20.20.23,239.1.1.1) Flags: K HW DDE
   0x3C  OIF-IC count: 0, OIF-A count: 1
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   80800947/1000/496/3875, Other: 0/0/0
   Vlan100 Flags: RA A MA
   Vlan501, VXLAN v4 Encap (50000, 225.25.25.25) Flags: RF F
     CEF: Adjacency with MAC:
01005E0101014000FF117BB403030303E1191919000012B50000000008000000000C3500001005EB8005E246C847F35050800

     Pkts: 0/0/0    Rate: 0 pps

VTEP1#
```

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 185, local router ID is 3.3.3.3
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: 1001:1
 *>   [5][1002:1][20.20.20.23][239.1.1.1]/18
                      0.0.0.0                              32768 ?
 *>i  [7][1002:1][1111][20.20.20.23/32][239.1.1.1/32]/22
                      2.2.2.2                  0    100      0 ?
Route Distinguisher: 3.3.3.3:32867
 *>i  [7][3.3.3.3:32867][1111][20.20.20.23/32][239.1.1.1/32]/22
                      2.2.2.2                  0    100      0 ?
 *>i  [7][3.3.3.3:32867][1111][20.20.20.53/32][232.2.2.2/32]/22
                      2.2.2.2                  0    100      0 ?
VTEP1#
```

Outputs to Verify the Configuration on VTEP 2

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

```
VTEP2# show ip mroute vrf red 239.1.1.1 verbose

(*, 239.1.1.1), 23:58:51/stopped, RP 70.1.1.1, flags: SJC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan100, Forward/Sparse, 22:25:04/00:02:18, Pkts:0, flags:

(20.20.20.23, 239.1.1.1), 22:23:57/00:01:38, flags: TgQ
```

```
  Incoming interface: Vlan501, RPF nbr 3.3.3.3
  Outgoing interface list:
    Vlan100, Forward/Sparse, 20:15:43/00:02:18, Pkts:31, flags:


VTEP2# show ip mfib vrf red 239.1.1.1 verbose

 (*,239.1.1.1) Flags: C K HW
   0x100001E3  OIF-IC count: 0, OIF-A count: 1
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel26 Flags: RA A MA
   Vlan100 Flags: RF F NS
     CEF: Adjacency with MAC: 01005E010101481BA4CE5EBF0800
     Pkts: 0/0/0    Rate: 0 pps
 (20.20.20.23,239.1.1.1) Flags: K HW DDE
   0x10000093  OIF-IC count: 0, OIF-A count: 1
   SW Forwarding: 31/0/478/0, Other: 3/3/0
   HW Forwarding:   80707884/1000/504/3937, Other: 0/0/0
   Vlan501, VXLAN Decap Flags: RA A MA
   Vlan100 Flags: RF F NS
     CEF: Adjacency with MAC: 01005E010101481BA4CE5EBF0800
     Pkts: 0/0/31    Rate: 0 pps

VTEP2#
```

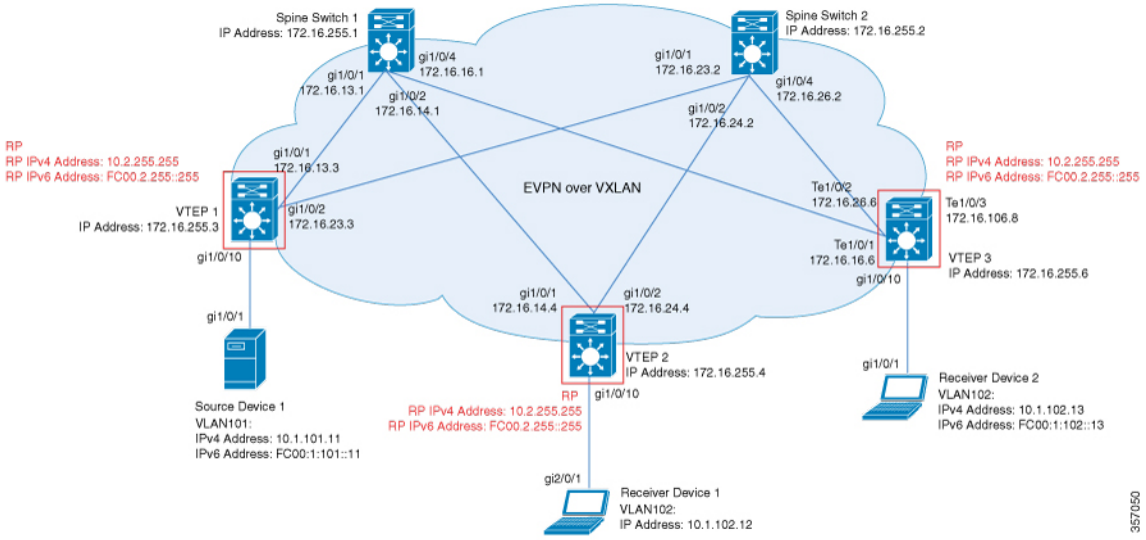
The following example shows the output for the **show ip bgp l2vpn evpn all** command on VTEP 2:

```
VTEP2# show ip bgp l2vpn evpn all

Route Distinguisher: 2.2.2.2:32867
 *>i  [2][2.2.2.2:32867][0][48][001301000001][32][20.20.20.23]/24
                      3.3.3.3                  0    100      0 ?
Route Distinguisher: 3.3.3.3:32867
 *>i  [2][3.3.3.3:32867][0][48][001301000001][0][*]/20
                      3.3.3.3                  0    100      0 ?
 *>i  [2][3.3.3.3:32867][0][48][001301000001][32][20.20.20.23]/24
                      3.3.3.3                  0    100      0 ?


VTEP2# show bgp ipv4 mvpn all
BGP table version is 158, local router ID is 2.2.2.2
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: 1001:1 (default for vrf red)

 *>i  [5][1001:1][20.20.20.23][239.1.1.1]/18
                      3.3.3.3                  0    100      0 ?
Route Distinguisher: 1002:1
 *>i  [5][1002:1][20.20.20.23][239.1.1.1]/18
                      3.3.3.3                  0    100      0 ?
Route Distinguisher: 1.1.1.1:32867
 *>   [7][1.1.1.1:32867][1111][20.20.20.21/32][239.1.1.1/32]/22
                      0.0.0.0                            32768 ?
```

```
Route Distinguisher: 3.3.3.3:32867
 *>    [7][3.3.3.3:32867][1111][20.20.20.23/32][239.1.1.1/32]/22
                         0.0.0.0                                32768 ?
```

Example: Configuring TRM in PIM Sparse Mode with Anycast RP

This example shows how to configure and verify Layer 3 TRM with PIM-SM for IPv4 and IPv6 multicast traffic when the every VTEP is an RP is inside the BGP EVPN VXLAN fabric.



The topology shows an EVPN VXLAN network with a receiver device and a source device connected to VTEP 1 and VTEP 2 respectively. The IPv4 multicast group is 226.1.1.1 and the IPv6 multicast group is FF06:1::1 in this topology. The following tables provide sample configurations for the devices in this topology:

Table 2: Configuring VTEP 1, VTEP 2, and VTEP 3 to Configure TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic

VTEP 1	VTEP 2	VTEP 3
Leaf-01# **show running-config** hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !	Leaf-02# **show running-config** hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !	Leaf-03# **show running-config** hostname Leaf-03 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !

VTEP 1	VTEP 2	VTEP 3
interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::255/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.1 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::1/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access !	interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::2/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.2 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::2/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 102 switchport mode access !	interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::255/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.3 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::3/128 ipv6 enable ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/10 switchport access vlan 102 switchport mode access !

VTEP 1	VTEP 2	VTEP 3
interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 !	interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 !	interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 !

VTEP 1	VTEP 2	VTEP 3
address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end Leaf-01#	address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end Leaf-02#	address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end Leaf-03#

Table 3: Configuring Spine Switch 1 and Spine Switch 2 to Configure TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic

Spine Switch 1

```
Spine-01# show running-config
hostname Spine-01
!
ip routing
!
ip multicast-routing
!
ipv6 unicast-routing
!
system mtu 9198
!
interface Loopback0
ip address 172.16.255.1 255.255.255.255
ip ospf 1 area 0
!
interface Loopback1
ip address 172.16.254.1 255.255.255.255
ip ospf 1 area 0
!
interface Loopback2
ip address 172.16.255.255 255.255.255.255
ip pim sparse-mode
ip ospf 1 area 0
!
interface GigabitEthernet1/0/1
no switchport
ip address 172.16.13.1 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/2
no switchport
ip address 172.16.14.1 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/4
no switchport
ip address 172.16.16.1 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
router ospf 1
router-id 172.16.255.1
!
router bgp 65001
bgp router-id 172.16.255.1
bgp log-neighbor-changes
no bgp default ipv4-unicast
neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0
!
```

Spine Switch 2

```
Spine-02# show running-config
hostname Spine-02
!
ip routing
!
ip multicast-routing
!
ipv6 unicast-routing
!
system mtu 9198
!
interface Loopback0
ip address 172.16.255.2 255.255.255.255
ip ospf 1 area 0
!
interface Loopback1
ip address 172.16.254.2 255.255.255.255
ip ospf 1 area 0
!
interface Loopback2
ip address 172.16.255.255 255.255.255.255
ip pim sparse-mode
ip ospf 1 area 0
!
interface GigabitEthernet1/0/1
no switchport
ip address 172.16.23.2 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/2
no switchport
ip address 172.16.24.2 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/4
no switchport
ip address 172.16.26.2 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
router ospf 1
router-id 172.16.255.2
!
router bgp 65001
bgp router-id 172.16.255.2
bgp log-neighbor-changes
no bgp default ipv4-unicast
neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0
!
```

Spine Switch 1	Spine Switch 2
address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end Spine-01#	address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end Spine-02#

Verifying TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic

The following sections provide sample outputs for **show** commands to verify TRM with PIM-SM on the devices in the topology configured above:

- Outputs to Verify the Configuration on VTEP 1, on page 42
- Outputs to Verify the Configuration on VTEP 2, on page 49
- Outputs to Verify the Configuration on VTEP 3, on page 56
- Outputs to Verify the Configuration on Spine Switch 1, on page 64

• Outputs to Verify the Configuration on Spine Switch 2, on page 68

Outputs to Verify the Configuration on VTEP 1

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

```
Leaf-01# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 01:47:43
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 01:47:43
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 01:47:43
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 01:47:43
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  01:47:43
nve1       10102    L2CP 172.16.254.6     7              10102      UP   N/A  01:47:43
Leaf-01#
```

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

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10102    172.16.254.4            7          10102    01:47:43
nve1      10102    172.16.254.6            7          10102    01:47:43


Leaf-01#show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 8, main routing table version 8
3 network entries using 1176 bytes of memory
4 path entries using 640 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4456 total bytes of memory
BGP activity 69/0 prefixes, 92/2 paths, scan interval 60 secs
3 networks peaked at 11:32:31 Sep 16 2020 UTC (01:42:43.716 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001     140     127        8    0    0 01:48:48        1
172.16.255.2    4        65001     146     128        8    0    0 01:48:40        1
Leaf-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 1:

```
Leaf-01# show bgp ipv6 mvpn all
BGP table version is 8, local router ID is 172.16.255.3
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: 1:1 (default for vrf green)
 *>   [5][1:1][FC00:1:101::11][FF06:1::1]/42
```

```
                      ::                                    32768 ?
 *>i  [7][1:1][65001][FC00:1:101::11][FF06:1::1]/46
                      172.16.255.4            0    100      0 ?
Route Distinguisher: 172.16.254.3:101
 * i  [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
                      172.16.255.4            0    100      0 ?
 *>i                   172.16.255.4            0    100      0 ?
Leaf-01#
```

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

```
Leaf-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 65, main routing table version 65
42 network entries using 16128 bytes of memory
60 path entries using 12720 bytes of memory
11/11 BGP path/bestpath attribute entries using 3168 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 34048 total bytes of memory
BGP activity 69/0 prefixes, 92/2 paths, scan interval 60 secs
42 networks peaked at 11:27:30 Sep 16 2020 UTC (01:47:45.010 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001     140     127       65    0    0 01:48:48        18
172.16.255.2    4        65001     146     128       65    0    0 01:48:40        18
Leaf-01#
```

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

```
Leaf-01# show bgp l2vpn evpn summary
BGP table version is 65, local router ID is 172.16.255.3
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: 172.16.254.3:101
 *>   [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                      ::                                    32768 ?
 *>   [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                      ::                                    32768 ?
 *>   [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
                      ::                                    32768 ?
 *>   [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                      ::                                    32768 ?
 *>   [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                      ::                                    32768 ?
 *>   [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                      ::                                    32768 ?
Route Distinguisher: 172.16.254.3:102
 *>i  [2][172.16.254.3:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                      172.16.254.6            0    100      0 ?
```

```
 *>i  [2][172.16.254.3:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][44D3CA286CC5][0][*]/20
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][ECE1A93792C5][0][*]/20
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.3:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                     172.16.254.6             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][0][*]/20
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
Route Distinguisher: 172.16.254.6:102
 *>i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][0][*]/20
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
Route Distinguisher: 1:1 (default for vrf green)
 *>   [5][1:1][0][24][10.1.101.0]/17
                     0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][24][10.1.102.0]/17
```

```
                     172.16.254.4             0    100      0 ?
 * i                   172.16.254.4             0    100      0 ?
 *>   [5][1:1][0][32][10.1.255.1]/17
                     0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][32][10.1.255.2]/17
                     172.16.254.4             0    100      0 ?
 * i                   172.16.254.4             0    100      0 ?
 *>i  [5][1:1][0][32][10.1.255.3]/17
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
 *>   [5][1:1][0][32][10.2.255.255]/17
                     0.0.0.0                  0         32768 ?
 *>   [5][1:1][0][64][FC00:1:101::]/29
                     ::                       0         32768 ?
 *>i  [5][1:1][0][64][FC00:1:102::]/29
                     172.16.254.4             0    100      0 ?
 * i                   172.16.254.4             0    100      0 ?
 *>   [5][1:1][0][128][FC00:1:255::1]/29
                     ::                       0         32768 ?
 *>i  [5][1:1][0][128][FC00:1:255::2]/29
                     172.16.254.4             0    100      0 ?
 * i                   172.16.254.4             0    100      0 ?
 *>i  [5][1:1][0][128][FC00:1:255::3]/29
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
 *>   [5][1:1][0][128][FC00:2:255::255]/29
                     ::                       0         32768 ?
Leaf-01#
```

The following example shows the output for the **show ipv6 pim vrf** *vrf-name* **group-map** command on VTEP 1:

```
Leaf-01# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Tu2,FC00:2:255::255 (us)
    Info source: Static
    Uptime: 01:49:05, Groups: 1
Leaf-01#
```

The following example shows the output for the **show ipv6 route vrf** command on VTEP 1:

```
Leaf-01# show ipv6 route vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
      Last updated 01:49:06 ago
Leaf-01#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 1:

```
Leaf-01# show ipv6 mld vrf green groups
No groups found.
Leaf-01#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 1:

```
Leaf-01# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(FC00:1:101::11, FF06:1::1), 01:42:44/00:03:19, flags: SFTGq
  Incoming interface: Vlan101
  RPF nbr: FE80::F6CF:E2FF:FE43:34C1
  Immediate Outgoing interface list:
    Vlan901, Forward, 01:42:44/never
Leaf-01#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 1:

```
Leaf-01# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (FC00:1:101::11,FF06:1::1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 1/0/1
   HW Forwarding:   3161/0/118/0, Other: 0/0/0
   Vlan101 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
Leaf-01#
```

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

```
Leaf-01# 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,
       e - encap-helper tunnel flag
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), 01:48:56/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:48:56/00:02:56

(172.16.254.3, 239.1.1.1), 01:42:42/00:03:20, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 01:42:42/00:03:03

(*, 224.0.1.40), 01:49:06/00:02:55, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 01:49:05/00:02:55

(*, 225.0.0.102), 01:48:56/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:48:56/00:02:56

(172.16.254.4, 225.0.0.102), 01:48:17/00:01:19, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:48:17/00:02:56

(172.16.254.6, 225.0.0.102), 01:48:23/00:01:18, flags: Tx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:48:23/00:02:56

(*, 225.0.0.101), 01:49:01/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:48:56/00:02:56

(172.16.254.3, 225.0.0.101), 01:49:01/00:02:45, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 01:48:25/00:03:12
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 2/0/125/0, Other: 1/0/1
   HW Forwarding:   554/0/163/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/172/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   561/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 1/1/0
   HW Forwarding:   504/0/205/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,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
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
```

```
 (172.16.254.3,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 1/1/0
   HW Forwarding:   3071/0/156/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
Leaf-01#
```

Return to Verifying TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic, on page 41

Outputs to Verify the Configuration on VTEP 2

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

```
Leaf-02# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 01:52:57
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 01:52:57
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 01:52:57
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 01:52:57
nve1       10101    L2CP 172.16.254.3     7              10101      UP   N/A  01:52:57
nve1       10102    L2CP 172.16.254.6     7              10102      UP   N/A  01:52:57
Leaf-02#
```

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

```
Leaf-02# show l2vpn evpn peers vxlan

Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            7          10101    01:52:57
nve1      10102    172.16.254.6            7          10102    01:52:57
Leaf-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on VTEP 2:

```
Leaf-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 5, main routing table version 5
2 network entries using 784 bytes of memory
3 path entries using 480 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3904 total bytes of memory
BGP activity 70/0 prefixes, 101/6 paths, scan interval 60 secs
2 networks peaked at 11:37:07 Sep 16 2020 UTC (01:47:58.150 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001     150     133        5    0    0 01:53:34        1
172.16.255.2    4        65001     151     134        5    0    0 01:53:30        1
Leaf-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 2:

```
Leaf-02# show bgp ipv6 mvpn all
BGP table version is 5, local router ID is 172.16.255.4
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: 1:1 (default for vrf green)
 * i  [5][1:1][FC00:1:101::11][FF06:1::1]/42
                     172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.3:101
 *>   [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
                     ::                                    32768 ?
Leaf-02#
```

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

```
Leaf-02# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 43, main routing table version 43
42 network entries using 16128 bytes of memory
64 path entries using 13568 bytes of memory
12/12 BGP path/bestpath attribute entries using 3456 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 35184 total bytes of memory
BGP activity 70/0 prefixes, 101/6 paths, scan interval 60 secs
42 networks peaked at 11:32:07 Sep 16 2020 UTC (01:52:58.436 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001     150     133       43    0    0 01:53:35        20
172.16.255.2    4        65001     151     134       43    0    0 01:53:31        20
Leaf-02#
```

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

```
Leaf-02# show bgp l2vpn evpn
BGP table version is 43, local router ID is 172.16.255.4
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: 172.16.254.3:101
 *>i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
```

```
 *>i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:101
 *>i  [2][172.16.254.4:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.4:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.4:101][0][48][F4CFE24334C1][0][*]/20
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.4:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.4:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.4:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                     172.16.254.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [2][172.16.254.4:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                     172.16.254.6             0    100      0 ?
 *>   [2][172.16.254.4:102][0][48][44D3CA286CC5][0][*]/20
                     ::                                    32768 ?
 *>   [2][172.16.254.4:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                     ::                                    32768 ?
 *>   [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                     ::                                    32768 ?
 *>   [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                     ::                                    32768 ?
 *>   [2][172.16.254.4:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                     ::                                    32768 ?
 *>   [2][172.16.254.4:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
                     ::                                    32768 ?
 *>i  [2][172.16.254.4:102][0][48][ECE1A93792C5][0][*]/20
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                     172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                     172.16.254.6             0    100      0 ?
Route Distinguisher: 172.16.254.6:102
 *>i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][0][*]/20
                     172.16.254.6             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
```

```
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
Route Distinguisher: 1:1 (default for vrf green)
 *>i  [5][1:1][0][24][10.1.101.0]/17
                     172.16.254.3             0    100      0 ?
 * i                   172.16.254.3             0    100      0 ?
 *>   [5][1:1][0][24][10.1.102.0]/17
                     0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][32][10.1.255.1]/17
                     172.16.254.3             0    100      0 ?
 * i                   172.16.254.3             0    100      0 ?
 *>   [5][1:1][0][32][10.1.255.2]/17
                     0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][32][10.1.255.3]/17
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][32][10.2.255.255]/17
                     172.16.254.3             0    100      0 ?
 * i                   172.16.254.3             0    100      0 ?
 *>                    0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][64][FC00:1:101::]/29
                     172.16.254.3             0    100      0 ?
 * i                   172.16.254.3             0    100      0 ?
 *>   [5][1:1][0][64][FC00:1:102::]/29
                     ::                       0         32768 ?
 *>i  [5][1:1][0][128][FC00:1:255::1]/29
                     172.16.254.3             0    100      0 ?
 * i                   172.16.254.3             0    100      0 ?
 *>   [5][1:1][0][128][FC00:1:255::2]/29
                     ::                       0         32768 ?
 *>i  [5][1:1][0][128][FC00:1:255::3]/29
                     172.16.254.6             0    100      0 ?
 * i                   172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][128][FC00:2:255::255]/29
                     172.16.254.3             0    100      0 ?
 * i                   172.16.254.3             0    100      0 ?
 *>                    ::                       0         32768 ?
Leaf-02#
```

The following example shows the output for the **show ipv6 pim vrf** *vrf-name* **group-map** command on VTEP 2:

```
Leaf-02# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Tu2,FC00:2:255::255 (us)
    Info source: Static
    Uptime: 01:54:21, Groups: 1
Leaf-02#
```

The following example shows the output for the **show ipv6 route vrf** command on VTEP 2:

```
Leaf-02# show ipv6 route vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
      Last updated 01:54:21 ago
Leaf-02#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 2:

```
Leaf-02# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan102
   01:53:45  00:03:52
Leaf-02#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 2:

```
Leaf-02# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 01:53:45/never, RP FC00:2:255::255, flags: SCJ
  Incoming interface: Tunnel2
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    Vlan102, Forward, 01:53:45/never

(FC00:1:101::11, FF06:1::1), 01:47:58/never, flags: STgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Inherited Outgoing interface list:
    Vlan102, Forward, 01:53:45/never
Leaf-02#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 2:

```
Leaf-02# show ipv6 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,
```

```
                e   - Encap helper tunnel flag.
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
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel2 Flags: A NS
   Vlan102 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:101::11,FF06:1::1) Flags: HW
   SW Forwarding: 1/0/100/0, Other: 0/0/0
   HW Forwarding:   3225/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan102 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
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), 01:54:12/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:54:12/00:00:41

(172.16.254.3, 239.1.1.1), 01:47:56/00:02:39, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:47:56/00:00:03

(*, 224.0.1.40), 01:54:21/00:02:39, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 01:54:20/00:02:39
```

```
(*, 225.0.0.102), 01:54:12/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:54:12/00:00:41

(172.16.254.6, 225.0.0.102), 01:53:36/00:00:58, flags: Tx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:53:36/00:00:41

(172.16.254.4, 225.0.0.102), 01:53:47/00:02:53, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 01:53:36/00:02:40, A

(*, 225.0.0.101), 01:54:12/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:54:12/00:00:41

(172.16.254.3, 225.0.0.101), 01:53:11/00:01:39, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:53:11/00:00:48
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/190/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
```

```
    SW Forwarding: 1/0/172/0, Other: 0/0/0
    HW Forwarding:   529/0/177/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (*,225.0.0.102) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,225.0.0.102) Flags: HW
    SW Forwarding: 2/0/163/0, Other: 3/1/2
    HW Forwarding:   631/0/163/0, Other: 0/0/0
    Null0 Flags: A
    GigabitEthernet1/0/2 Flags: F
      Pkts: 0/0/2    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   530/0/205/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   1/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.3,239.1.1.1) Flags: HW
    SW Forwarding: 1/0/150/0, Other: 0/0/0
    HW Forwarding:   3224/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
Leaf-02#
```

Return to Verifying TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic, on page 41

Outputs to Verify the Configuration on VTEP 3

The following example shows the output for the **show nve peers** command on VTEP 3:

```
Leaf-03# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 02:01:22
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 02:01:22
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 02:01:22
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 02:01:22
nve1       10101    L2CP 172.16.254.3     7              10101      UP   N/A  02:01:22
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  02:01:22
Leaf-03#
```

The following example shows the output for the **show l2vpn evpn peers vxlan** command on VTEP 3:

```
Leaf-03# show l2vpn evpn peers vxlan
```

```
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            7          10101    02:01:23
nve1      10102    172.16.254.4            7          10102    02:01:23
Leaf-03#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on VTEP 3:

```
Leaf-03# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 5, main routing table version 5
2 network entries using 784 bytes of memory
3 path entries using 480 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3904 total bytes of memory
BGP activity 66/0 prefixes, 97/0 paths, scan interval 60 secs
2 networks peaked at 11:29:08 Sep 16 2020 UTC (01:56:22.908 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001     160     143        5    0    0 02:01:59        1
172.16.255.2    4        65001     159     142        5    0    0 02:01:59        1
Leaf-03#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 3:

```
Leaf-03# show bgp ipv6 mvpn all
BGP table version is 5, local router ID is 172.16.255.6
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: 1:1 (default for vrf green)
 * i  [5][1:1][FC00:1:101::11][FF06:1::1]/42
                     172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.3:101
 *>   [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
                     ::                                    32768 ?
Leaf-03#
```

The following example shows the output for the **show bgp l2vpn evpn summary** command on VTEP 3:

```
Leaf-03# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 51, main routing table version 51
42 network entries using 16128 bytes of memory
68 path entries using 14416 bytes of memory
12/12 BGP path/bestpath attribute entries using 3456 bytes of memory
```

```
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 36032 total bytes of memory
BGP activity 66/0 prefixes, 97/0 paths, scan interval 60 secs
42 networks peaked at 11:24:07 Sep 16 2020 UTC (02:01:24.200 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001     160     143       51    0    0 02:02:00        22
172.16.255.2    4        65001     159     142       51    0    0 02:01:59        22
Leaf-03#
```

The following example shows the output for the **show bgp l2vpn evpn** command on VTEP 3:

```
Leaf-03# show bgp l2vpn evpn
BGP table version is 51, local router ID is 172.16.255.6
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: 172.16.254.3:101
 *>i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][0][*]/20
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.4:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
```

```
                     172.16.254.4             0    100      0 ?
 * i                   172.16.254.4             0    100      0 ?
Route Distinguisher: 172.16.254.6:101
 *>i  [2][172.16.254.6:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.6:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.6:101][0][48][F4CFE24334C1][0][*]/20
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.6:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.6:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                     172.16.254.3             0    100      0 ?
 *>i  [2][172.16.254.6:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                     172.16.254.3             0    100      0 ?
Route Distinguisher: 172.16.254.6:102
 *>   [2][172.16.254.6:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                     ::                                    32768 ?
 *>   [2][172.16.254.6:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                     ::                                    32768 ?
 *>i  [2][172.16.254.6:102][0][48][44D3CA286CC5][0][*]/20
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                     172.16.254.4             0    100      0 ?
 *>i  [2][172.16.254.6:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
                     172.16.254.4             0    100      0 ?
 *>   [2][172.16.254.6:102][0][48][ECE1A93792C5][0][*]/20
                     ::                                    32768 ?
 *>   [2][172.16.254.6:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
                     ::                                    32768 ?
 *>   [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                     ::                                    32768 ?
 *>   [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                     ::                                    32768 ?
Route Distinguisher: 1:1 (default for vrf green)
 *>i  [5][1:1][0][24][10.1.101.0]/17
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][24][10.1.102.0]/17
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>                  0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][32][10.1.255.1]/17
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>i  [5][1:1][0][32][10.1.255.2]/17
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 *>   [5][1:1][0][32][10.1.255.3]/17
                     0.0.0.0                  0         32768 ?
 * i  [5][1:1][0][32][10.2.255.255]/17
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>                  0.0.0.0                  0         32768 ?
 *>i  [5][1:1][0][64][FC00:1:101::]/29
                     172.16.254.3             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][64][FC00:1:102::]/29
```

```
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>                     ::                       0         32768 ?
 *>i  [5][1:1][0][128][FC00:1:255::1]/29
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i  [5][1:1][0][128][FC00:1:255::2]/29
                      172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 *>   [5][1:1][0][128][FC00:1:255::3]/29
                      ::                       0         32768 ?
 * i  [5][1:1][0][128][FC00:2:255::255]/29
                      172.16.254.3             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>                     ::                       0         32768 ?
Leaf-03#
```

The following example shows the output for the **show ipv6 pim vrf** *vrf-name* **group-map** command on VTEP 3:

```
Leaf-03# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Tu2,FC00:2:255::255 (us)
    Info source: Static
    Uptime: 02:02:54, Groups: 1
Leaf-03#
```

The following example shows the output for the **show ipv6 route vrf** command on VTEP 3:

```
Leaf-03# show ipv6 route vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
      Last updated 02:02:55 ago
Leaf-03#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 3:

```
Leaf-03# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan102
   02:02:06  00:03:50
Leaf-03#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 3:

```
Leaf-03# show ipv6 mroute vrf green
Multicast Routing Table
```

```
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 02:02:06/never, RP FC00:2:255::255, flags: SCJ
  Incoming interface: Tunnel2
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    Vlan102, Forward, 02:02:06/never

(FC00:1:101::11, FF06:1::1), 01:56:23/never, flags: STgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Inherited Outgoing interface list:
    Vlan102, Forward, 02:02:06/never
Leaf-03#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 3:

```
Leaf-03# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel2 Flags: A NS
   Vlan102 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:101::11,FF06:1::1) Flags: HW
   SW Forwarding: 1/0/100/0, Other: 0/0/0
   HW Forwarding:   3475/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan102 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
Leaf-03#
```

The following example shows the output for the **show ip mroute** command on VTEP 3:

```
Leaf-03# 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,
       e - encap-helper tunnel flag
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), 02:02:45/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:02:45/00:01:07

(172.16.254.3, 239.1.1.1), 01:56:21/00:02:07, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:56:21/00:00:37

(*, 224.0.1.40), 02:02:55/00:02:10, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback0, Forward/Sparse, 02:02:54/00:02:10

(*, 225.0.0.102), 02:02:45/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:02:45/00:01:07

(172.16.254.4, 225.0.0.102), 02:01:56/00:02:46, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:01:56/00:01:07

(172.16.254.6, 225.0.0.102), 02:02:08/00:02:37, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 02:01:58/00:02:59

(*, 225.0.0.101), 02:02:45/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:02:45/00:01:07

(172.16.254.3, 225.0.0.101), 02:01:36/00:01:06, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:01:36/00:01:23
Leaf-03#
```

The following example shows the output for the **show ip mfib** command on VTEP 3:

```
Leaf-03# 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,
                e   - Encap helper tunnel flag.
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: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel0, VXLAN Decap Flags: NS
 (*,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
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.0/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/190/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 1/0/172/0, Other: 0/0/0
   HW Forwarding:   568/0/177/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/172/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   632/0/176/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 2/0/180/0, Other: 3/0/3
   HW Forwarding:   610/0/189/0, Other: 0/0/0
   Null0 Flags: A
   TenGigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
```

```
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/168/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   3474/0/168/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
Leaf-03#
```

Return to Verifying TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic, on page 41

Outputs to Verify the Configuration on Spine Switch 1

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Spine Switch 1:

```
Spine-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 20, main routing table version 20
2 network entries using 784 bytes of memory
5 path entries using 800 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4144 total bytes of memory
BGP activity 1001/969 prefixes, 7359/7288 paths, scan interval 60 secs
2 networks peaked at 11:16:15 Sep 16 2020 UTC (02:20:36.059 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001     148     161       20    0    0 02:08:00        1
172.16.255.4    4        65001     148     165       20    0    0 02:07:32        1
172.16.255.6    4        65001     149     166       20    0    0 02:07:32        1
Spine-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Spine Switch 1:

```
Spine-01# show bgp ipv6 mvpn all
BGP table version is 20, local router ID is 172.16.255.1
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: 1:1
 * i  [5][1:1][FC00:1:101::11][FF06:1::1]/42
                     172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.3:101
 * i  [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
```

```
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i                  172.16.255.6             0    100      0 ?
Spine-01#
```

The following example shows the output for the **show bgp l2vpn evpn summary** command on Spine Switch 1:

```
Spine-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 785, main routing table version 785
30 network entries using 10320 bytes of memory
66 path entries using 13728 bytes of memory
11/11 BGP path/bestpath attribute entries using 3168 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 29168 total bytes of memory
BGP activity 1001/969 prefixes, 7359/7288 paths, scan interval 60 secs
44 networks peaked at 10:13:07 Aug 6 2020 UTC (5w6d ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001     148     161      785    0    0 02:08:00       12
172.16.255.4    4        65001     148     165      785    0    0 02:07:33       12
172.16.255.6    4        65001     149     166      785    0    0 02:07:33       12
Spine-01#
```

The following example shows the output for the **show bgp l2vpn evpn** command on Spine Switch 1:

```
Spine-01# show bgp l2vpn evpn
BGP table version is 785, local router ID is 172.16.255.1
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: 172.16.254.3:101
 * i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
```

```
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][0][*]/20
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
Route Distinguisher: 172.16.254.6:102
 * i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][0][*]/20
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
Route Distinguisher: 1:1
 * i  [5][1:1][0][24][10.1.101.0]/17
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 *>i  [5][1:1][0][24][10.1.102.0]/17
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.4             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][32][10.1.255.1]/17
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][32][10.1.255.2]/17
                     172.16.254.4             0    100      0 ?
 *>i                  172.16.254.4             0    100      0 ?
 * i  [5][1:1][0][32][10.1.255.3]/17
                     172.16.254.6             0    100      0 ?
 *>i                  172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][32][10.2.255.255]/17
                     172.16.254.4             0    100      0 ?
 * i                  172.16.254.6             0    100      0 ?
 * i                  172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][64][FC00:1:101::]/29
                     172.16.254.3             0    100      0 ?
 *>i                  172.16.254.3             0    100      0 ?
 *>i  [5][1:1][0][64][FC00:1:102::]/29
                     172.16.254.4             0    100      0 ?
```

```
 * i                    172.16.254.4             0    100      0 ?
 * i                    172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][128][FC00:1:255::1]/29
                       172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][128][FC00:1:255::2]/29
                       172.16.254.4             0    100      0 ?
 *>i                    172.16.254.4             0    100      0 ?
 * i  [5][1:1][0][128][FC00:1:255::3]/29
                       172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][128][FC00:2:255::255]/29
                       172.16.254.4             0    100      0 ?
 * i                    172.16.254.6             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
Spine-01#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 1:

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-01#
```

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

```
Spine-01# 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

(*, 224.0.1.40), 1w2d/00:02:38, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w2d/00:02:38

(*, 225.0.0.102), 1w2d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 02:04:11/00:02:37, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
```

```
(172.16.254.6, 225.0.0.102), 02:07:34/00:00:34, flags: PTA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null
Spine-01#
```

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

```
Spine-01# 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: 84/84/0
   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
   Tunnel1 Flags: A
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 4/0/193/0, Other: 41/0/41
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/2 Flags: NS
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/206/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   GigabitEthernet1/0/4 Flags: A NS
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
Spine-01#
```

Return to Verifying TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic, on page 41

Outputs to Verify the Configuration on Spine Switch 2

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Spine Switch 2:

```
Spine-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
```

```
BGP table version is 20, main routing table version 20
2 network entries using 784 bytes of memory
5 path entries using 800 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4144 total bytes of memory
BGP activity 1031/999 prefixes, 7443/7372 paths, scan interval 60 secs
2 networks peaked at 11:17:12 Sep 16 2020 UTC (02:22:21.833 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001     150     169       20    0    0 02:09:38        1
172.16.255.4    4        65001     151     168       20    0    0 02:09:14        1
172.16.255.6    4        65001     150     167       20    0    0 02:09:18        1
Spine-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Spine Switch 2:

```
Spine-02# show bgp ipv6 mvpn all
BGP table version is 20, local router ID is 172.16.255.2
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: 1:1
 * i  [5][1:1][FC00:1:101::11][FF06:1::1]/42
                      172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.3:101
 *>i  [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
Spine-02#
```

The following example shows the output for the **show bgp l2vpn evpn summary** command on Spine Switch 2:

```
Spine-02# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 712, main routing table version 712
30 network entries using 10320 bytes of memory
66 path entries using 13728 bytes of memory
11/11 BGP path/bestpath attribute entries using 3168 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 29168 total bytes of memory
BGP activity 1031/999 prefixes, 7443/7372 paths, scan interval 60 secs
44 networks peaked at 10:13:54 Aug 6 2020 UTC (5w6d ago)
```

```
Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001     150     169      712    0    0 02:09:38        12
172.16.255.4    4        65001     151     168      712    0    0 02:09:15        12
172.16.255.6    4        65001     150     167      712    0    0 02:09:18        12
Spine-02#
```

The following example shows the output for the **show bgp l2vpn evpn** command on Spine Switch 2:

```
Spine-02# show bgp l2vpn evpn
BGP table version is 712, local router ID is 172.16.255.2
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: 172.16.254.3:101
 * i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
                      172.16.254.3             0    100      0 ?
 *>i                   172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
                      172.16.254.3             0    100      0 ?
 *>i                   172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
                      172.16.254.3             0    100      0 ?
 *>i                   172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
                      172.16.254.3             0    100      0 ?
 *>i                   172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
                      172.16.254.3             0    100      0 ?
 *>i                   172.16.254.3             0    100      0 ?
 * i  [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
                      172.16.254.3             0    100      0 ?
 *>i                   172.16.254.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][0][*]/20
                      172.16.254.4             0    100      0 ?
 *>i                   172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
                      172.16.254.4             0    100      0 ?
 *>i                   172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
                      172.16.254.4             0    100      0 ?
 *>i                   172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
                      172.16.254.4             0    100      0 ?
 *>i                   172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][7C210DBD954D][32][10.1.102.1]/24
                      172.16.254.4             0    100      0 ?
 *>i                   172.16.254.4             0    100      0 ?
 * i  [2][172.16.254.4:102][0][48][7C210DBD954D][128][FC00:1:102::1]/36
                      172.16.254.4             0    100      0 ?
 *>i                   172.16.254.4             0    100      0 ?
Route Distinguisher: 172.16.254.6:102
 * i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][32][10.1.102.1]/24
                      172.16.254.6             0    100      0 ?
 *>i                   172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][0C75BD67EF4D][128][FC00:1:102::1]/36
                      172.16.254.6             0    100      0 ?
```

```
 *>i                    172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][0][*]/20
                        172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][32][10.1.102.13]/24
                        172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FC00:1:102::13]/36
                        172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
 * i  [2][172.16.254.6:102][0][48][ECE1A93792C5][128][FE80::EEE1:A9FF:FE37:92C5]/36
                        172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
Route Distinguisher: 1:1
 * i  [5][1:1][0][24][10.1.101.0]/17
                        172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
 *>i  [5][1:1][0][24][10.1.102.0]/17
                        172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 * i                    172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][32][10.1.255.1]/17
                        172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][32][10.1.255.2]/17
                        172.16.254.4             0    100      0 ?
 *>i                    172.16.254.4             0    100      0 ?
 * i  [5][1:1][0][32][10.1.255.3]/17
                        172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][32][10.2.255.255]/17
                        172.16.254.4             0    100      0 ?
 * i                    172.16.254.6             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][64][FC00:1:101::]/29
                        172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
 *>i  [5][1:1][0][64][FC00:1:102::]/29
                        172.16.254.4             0    100      0 ?
 * i                    172.16.254.4             0    100      0 ?
 * i                    172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][128][FC00:1:255::1]/29
                        172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
 * i  [5][1:1][0][128][FC00:1:255::2]/29
                        172.16.254.4             0    100      0 ?
 *>i                    172.16.254.4             0    100      0 ?
 * i  [5][1:1][0][128][FC00:1:255::3]/29
                        172.16.254.6             0    100      0 ?
 *>i                    172.16.254.6             0    100      0 ?
 * i  [5][1:1][0][128][FC00:2:255::255]/29
                        172.16.254.4             0    100      0 ?
 * i                    172.16.254.6             0    100      0 ?
 * i                    172.16.254.3             0    100      0 ?
 *>i                    172.16.254.3             0    100      0 ?
Spine-02#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 2:

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings
```

```
Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-02#
```

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

```
Spine-02# 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), 22:51:54/00:03:26, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:47/00:03:26
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:02:34
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:12

(172.16.254.3, 239.1.1.1), 02:03:40/00:02:43, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 02:03:40/00:03:12
    GigabitEthernet1/0/2, Forward/Sparse, 02:03:40/00:02:46

(*, 224.0.1.40), 1w2d/00:03:18, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:02:09/00:03:18
    GigabitEthernet1/0/1, Forward/Sparse, 00:02:10/00:03:17
    Loopback2, Forward/Sparse, 1w2d/00:02:45

(*, 225.0.0.102), 1w2d/00:03:22, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:47/00:02:35
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:03:16
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:22

(172.16.254.6, 225.0.0.102), 02:09:47/00:01:33, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:16/00:03:16
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:16/00:03:05

(172.16.254.4, 225.0.0.102), 02:09:47/00:02:06, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:19/00:03:10
```

```
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:22

(*, 225.0.0.101), 1w2d/00:03:29, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:47/00:03:29
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:02:31
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:29

(172.16.254.3, 225.0.0.101), 02:09:22/00:03:25, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:02:39
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:29
Spine-02#
```

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

```
Spine-02# 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: 1/1/0
   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
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 2/0/140/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   604/0/178/0, Other: 0/0/0
   GigabitEthernet1/0/1 Flags: A NS
```

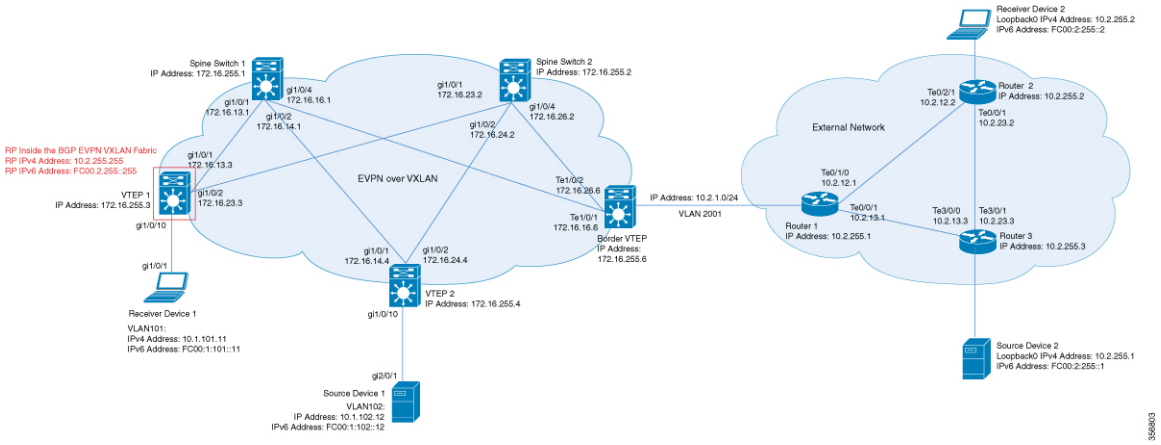
```
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (*,225.0.0.102) Flags: C HW
    SW Forwarding: 4/0/124/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   668/0/176/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   600/0/205/0, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 17/0/397/0, Other: 4/4/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.3,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   3693/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/1 Flags: A
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
Spine-02#
```

Return to Verifying TRM in PIM-SM with Anycast RP for IPv4 and IPv6 Multicast Traffic, on page 41

Example: Configuring TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

This example shows how to configure and verify Layer 3 TRM with PIM-SM for IPv4 multicast traffic when the RP is inside the BGP EVPN VXLAN fabric. The example uses the following topology:

Figure 13: TRM with PIM-SM when the RP is Inside the BGP EVPN VXLAN Fabric



The topology shows an EVPN VXLAN network, with two spine switches and three VTEPs, connected to an external network with three routers. VTEP 1 inside the BGP EVPN VXLAN fabric acts as the RP in this topology and Border VTEP connects the fabric to the external network through Router 1. The IPv4 multicast group is 226.1.1.1 in this topology. The following tables provide sample configurations for the devices in this topology:

Table 4: Configuring VTEP 1, Border VTEP, and VTEP 2 to Configure TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

VTEP 1	Border VTEP	VTEP 2
Leaf-01# **show running-config** hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0	Border# **show running-config** hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! vlan 2001 !	Leaf-02# **show running-config** hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-famil ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !

VTEP 1	Border VTEP	VTEP 2
!	interface Loopback0	interface Loopback0
interface Loopback1	ip address 172.16.255.6	ip address 172.16.255.4
ip address 172.16.254.3	255.255.255.255	255.255.255.255
255.255.255.255	ip pim sparse-mode	ip pim sparse-mode
ip pim sparse-mode	ip ospf 1 area 0	ip ospf 1 area 0
ip ospf 1 area 0	!	!
!	interface Loopback1	interface Loopback1
interface Loopback255	ip address 172.16.254.6	ip address 172.16.254.4
vrf forwarding green	255.255.255.255	255.255.255.255
ip address 10.2.255.255	ip pim sparse-mode	ip pim sparse-mode
255.255.255.255	ip ospf 1 area 0	ip ospf 1 area 0
ip pim sparse-mode	!	!
!	interface	interface GigabitEthernet1/0/1
interface GigabitEthernet1/0/1	TenGigabitEthernet1/0/1	no switchport
no switchport	no switchport	ip address 172.16.14.4
ip address 172.16.13.3	ip address 172.16.16.6	255.255.255.0
255.255.255.0	255.255.255.0	ip pim sparse-mode
ip pim sparse-mode	ip pim sparse-mode	ip ospf network point-to-point
ip ospf network point-to-point	ip ospf network point-to-point	ip ospf 1 area 0
ip ospf 1 area 0	ip ospf 1 area 0	!
!	!	interface GigabitEthernet1/0/2
interface GigabitEthernet1/0/2	interface	no switchport
no switchport	TenGigabitEthernet1/0/2	ip address 172.16.24.4
ip address 172.16.23.3	no switchport	255.255.255.0
255.255.255.0	ip address 172.16.26.6	ip pim sparse-mode
ip pim sparse-mode	255.255.255.0	ip ospf network point-to-point
ip ospf network point-to-point	ip pim sparse-mode	ip ospf 1 area 0
ip ospf 1 area 0	ip ospf network point-to-point	!
!	ip ospf 1 area 0	interface
interface	!	GigabitEthernet1/0/10
GigabitEthernet1/0/10	interface	switchport access vlan 102
switchport access vlan 101	TenGigabitEthernet1/0/5	switchport mode access
switchport mode access	switchport trunk allowed vlan	!
!	2001	interface Vlan101
interface Vlan101	switchport mode trunk	vrf forwarding green
vrf forwarding green	!	ip address 10.1.101.1
ip address 10.1.101.1	interface Vlan101	255.255.255.0
255.255.255.0	vrf forwarding green	ip pim sparse-mode
ip pim sparse-mode	ip address 10.1.101.1	!
!	255.255.255.0	interface Vlan102
interface Vlan102	ip pim sparse-mode	vrf forwarding green
vrf forwarding green	!	ip address 10.1.102.1
ip address 10.1.102.1	interface Vlan102	255.255.255.0
255.255.255.0	vrf forwarding green	ip pim sparse-mode
ip pim sparse-mode	ip address 10.1.102.1	!
!	255.255.255.0	interface Vlan901
interface Vlan901	ip pim sparse-mode	vrf forwarding green
vrf forwarding green	!	ip unnumbered Loopback1
ip unnumbered Loopback1	interface Vlan901	ip pim sparse-mode
ip pim sparse-mode	vrf forwarding green	no autostate
no autostate	ip unnumbered Loopback1	
!	ip pim sparse-mode	
	no autostate	
	!	

VTEP 1	Border VTEP	VTEP 2
interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family	interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 2 vrf green redistribute bgp 65001 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family	! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family !

VTEP 1	Border VTEP	VTEP 2
!	!	address-family ipv4 vrf green
address-family ipv4 vrf green	address-family l2vpn evpn	advertise l2vpn evpn
advertise l2vpn evpn	neighbor 172.16.255.1 activate	redistribute connected
redistribute connected	neighbor 172.16.255.1	redistribute static
redistribute static	send-community both	exit-address-family
exit-address-family	neighbor 172.16.255.2 activate	!
!	neighbor 172.16.255.2	ip pim rp-address
ip pim rp-address	send-community both	172.16.255.255
172.16.255.255	exit-address-family	ip pim ssm default
ip pim ssm default	!	ip pim vrf green rp-address
ip pim vrf green rp-address	address-family ipv4 vrf green	10.2.255.255
10.2.255.255	advertise l2vpn evpn	!
!	redistribute connected	end
end	redistribute static	!
!	redistribute ospf 2 match	Leaf-02#
Leaf-01#	internal external 1 external	
	2	
	exit-address-family	
	!	
	ip pim rp-address	
	172.16.255.255	
	ip pim ssm default	
	ip pim vrf green rp-address	
	10.2.255.255	
	!	
	end	
	!	
	Border#	

Table 5: Configuring Spine Switch 1 and Spine Switch 2 to Configure TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

Spine Switch 1	Spine Switch 2
Spine-01# **show running-config** hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 !	Spine-02# **show running-config** hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 !

Spine Switch 1	Spine Switch 2
address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01#	address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02#

Table 6: Configuring Router 1, Router 2, and Router 3 to Configure TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

Router 1	Router 2	Router 3
Router-01# **show running-config** hostname R1 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! end ! R1#	Router-02# **show running-config** hostname R2 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.2 ! ip pim rp-address 10.2.255.255 ! end ! R2#	Router-03# **show running-config** hostname R3 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! end ! R3#

Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

The following sections provide sample outputs for **show** commands to verify TRM with PIM-SM on the devices in the topology configured above:

- Outputs to Verify the Configuration on VTEP 1
- Outputs to Verify the Configuration on VTEP 2
- Outputs to Verify the Configuration on Border VTEP
- Outputs to Verify the Configuration on Spine Switch 1

• Outputs to Verify the Configuration on Spine Switch 2

Outputs to Verify the Configuration on VTEP 1 (RP Inside the BGP EVPN VXLAN Fabric)

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

```
Leaf-01# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 1d05h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 1d05h
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  1d05h
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  1d05h
Leaf-01#
```

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

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10102    172.16.254.4            7          10102    1d05h
nve1      10102    172.16.254.6            5          10102    1d05h
Leaf-01#
```

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

```
Leaf-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 111, main routing table version 111
7 network entries using 2128 bytes of memory
9 path entries using 1224 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
18 BGP extended community entries using 2396 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7492 total bytes of memory
BGP activity 140/45 prefixes, 240/112 paths, scan interval 60 secs
9 networks peaked at 12:22:24 Aug 6 2020 UTC (1d05h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    2104    1988      111    0    0 1d05h           2
172.16.255.2    4        65001    2099    1988      111    0    0 1d05h           2
Leaf-01#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **rp mapping** command on VTEP 1:

```
Leaf-01# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
```

```
Leaf-01#
```

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

```
Leaf-01# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "connected", distance 0, metric 0 (connected, via interface)
  Redistributing via bgp 65001
  Advertised by bgp 65001
  Routing Descriptor Blocks:
  * directly connected, via Loopback255
      Route metric is 0, traffic share count is 1
Leaf-01#
```

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

```
Leaf-01# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
226.1.1.1        Vlan102                  1d05h     00:02:50  10.1.102.12
224.0.1.40       Vlan901                  1d05h     00:02:03  172.16.254.4
Leaf-01#
```

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

```
Leaf-01# 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,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 1d01h/stopped, RP 10.2.255.255, flags: SJCGx
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan101, Forward/Sparse, 1d01h/00:02:33
    Vlan901, Forward/Sparse, 03:54:15/stopped

(10.2.255.1, 226.1.1.1), 00:01:13/00:01:50, flags: Tgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:01:13/00:02:33

(10.1.102.12, 226.1.1.1), 00:01:36/00:01:24, flags: Tgx
```

```
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:01:36/00:02:33

(*, 224.0.1.40), 1d05h/00:02:09, RP 10.2.255.255, flags: SJCLGx
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback901, Forward/Sparse, 1d05h/00:02:09
    Vlan901, Forward/Sparse, 03:54:15/stopped
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
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: 2/2/0
   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
   Tunnel6 Flags: A
   Loopback901 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (*,226.1.1.1) Flags: C HW
   SW Forwarding: 1/0/100/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel6 Flags: A
   Vlan101 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/1    Rate: 0 pps
 (10.1.102.12,226.1.1.1) Flags: HW
   SW Forwarding: 2/0/100/0, Other: 0/0/0
   HW Forwarding:   44/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan101 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
 (10.2.255.1,226.1.1.1) Flags: HW
   SW Forwarding: 5/0/100/0, Other: 12576/1/12575
   HW Forwarding:   3801/1/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan901 Flags: SP
   Vlan101 Flags: F NS
```

```
     Pkts: 0/0/5    Rate: 0 pps
Leaf-01#
```

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

```
Leaf-01# show bgp ipv4 mvpn all
BGP table version is 94, local router ID is 172.16.255.3
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: 1:1 (default for vrf green)
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 *>i  [5][1:1][10.2.255.1][226.1.1.1]/18
                      172.16.255.6             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 *>   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                      0.0.0.0                            32768 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                      0.0.0.0                            32768 ?
Leaf-01#
```

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

```
Leaf-01# 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,
       e - encap-helper tunnel flag
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), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10
```

```
(172.16.254.6, 239.1.1.1), 00:01:11/00:01:48, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:01:11/00:01:48

(172.16.254.3, 239.1.1.1), 00:01:37/00:01:22, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0, Registering
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:01:37/00:02:51, A

(172.16.254.4, 239.1.1.1), 04:17:32/00:02:31, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:17:32/00:00:27

(*, 224.0.1.40), 1d05h/00:02:12, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:12

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(172.16.254.4, 225.0.0.102), 1d05h/00:01:20, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:32

(172.16.254.6, 225.0.0.102), 1d05h/00:02:44, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(172.16.254.3, 225.0.0.101), 1d05h/00:02:36, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:03:20
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/114/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 13/0/127/0, Other: 2/2/0
   HW Forwarding:   12525/0/165/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/172/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   9155/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   3762/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 2/2/0
   HW Forwarding:   15/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 2/1/1
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F
     Pkts: 0/0/0    Rate: 0 pps
   Tunnel4 Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   7707/0/167/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
```

```
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 2/0/150/0, Other: 0/0/0
   HW Forwarding:   68/1/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
Leaf-01#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 82

Outputs to Verify the Configuration on VTEP 2

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

```
Leaf-02# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 1d05h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 1d05h
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  1d05h
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  1d05h
Leaf-02#
```

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

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            6          10101    1d05h
nve1      10102    172.16.254.6            5          10102    1d05h
Leaf-02#
```

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

```
Leaf-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 62, main routing table version 62
7 network entries using 2128 bytes of memory
9 path entries using 1224 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7156 total bytes of memory
BGP activity 121/28 prefixes, 202/77 paths, scan interval 60 secs
9 networks peaked at 12:22:24 Aug 6 2020 UTC (16:43:21.423 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1229    1151       62    0    0 16:57:50        2
172.16.255.2    4        65001    1227    1152       62    0    0 16:57:51        2
```

```
Leaf-02#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **rp mapping** command on VTEP 2:

```
Leaf-02# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
Leaf-02#
```

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

```
Leaf-02# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 0, type internal
  Last update from 172.16.254.3 on Vlan901, 03:59:59 ago
  Routing Descriptor Blocks:
  * 172.16.254.3 (default), from 172.16.255.1, 03:59:59 ago, via Vlan901
      opaque_ptr 0x7F65B8B9E9F0
      Route metric is 0, traffic share count is 1
      AS Hops 0
      MPLS label: none
Leaf-02#
```

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

```
Leaf-02# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
226.1.1.1        Vlan102                  16:58:00  00:02:11  10.1.102.12
224.0.1.40       Vlan901                  16:58:37  00:02:33  172.16.254.4
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode
```

```
(*, 226.1.1.1), 1d05h/stopped, RP 10.2.255.255, flags: SJCFg
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list:
    Vlan102, Forward/Sparse, 1d05h/00:02:50

(10.2.255.1, 226.1.1.1), 00:06:57/00:02:09, flags: TgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:06:57/00:02:50

(10.1.102.12, 226.1.1.1), 00:07:21/00:01:45, flags: FTGqx
  Incoming interface: Vlan102, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:07:21/stopped

(*, 224.0.1.40), 1d05h/00:02:03, RP 10.2.255.255, flags: SJPCLgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list: Null
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   Vlan901, VXLAN Decap Flags: A IC NS
 (*,226.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   3/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan102 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (10.1.102.12,226.1.1.1) Flags: HW
   SW Forwarding: 2/0/100/0, Other: 0/0/0
   HW Forwarding:   215/0/118/0, Other: 0/0/0
   Vlan102 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/2    Rate: 0 pps
 (10.2.255.1,226.1.1.1) Flags: HW
   SW Forwarding: 2/0/100/0, Other: 0/0/0
Leaf-02#
```

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

```
Leaf-02# show bgp ipv4 mvpn all
BGP table version is 94, local router ID is 172.16.255.3
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: 1:1 (default for vrf green)
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 *>i  [5][1:1][10.2.255.1][226.1.1.1]/18
                     172.16.255.6             0    100      0 ?
 * i                  172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 *>   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                     0.0.0.0                            32768 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                     0.0.0.0                            32768 ?
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
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), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:59

(172.16.254.6, 239.1.1.1), 00:06:55/00:01:59, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:06:55/00:02:04
```

```
(172.16.254.4, 239.1.1.1), 04:23:16/00:03:29, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 04:23:16/00:02:57

(*, 224.0.1.40), 1d05h/00:02:02, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:02
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/170/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   12469/0/177/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/224/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 2/0/163/0, Other: 3/1/2
   HW Forwarding:   9233/0/164/0, Other: 0/0/0
```

```
    Null0 Flags: A
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 1/0/206/0, Other: 0/0/0
    HW Forwarding:   3767/0/163/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   8/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 1/0/150/0, Other: 22/18/4
    HW Forwarding:   7870/0/156/0, Other: 0/0/0
    Null0 Flags: A
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 2/0/150/0, Other: 0/0/0
    HW Forwarding:   412/1/168/1, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/2    Rate: 0 pps
Leaf-02#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 82

Outputs to Verify the Configuration on Border VTEP

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

```
Border# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 1d05h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 1d05h
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  1d05h
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  1d05h
Border#
```

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

```
Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            6          10101    1d05h
nve1      10102    172.16.254.4            7          10102    1d05h
Border#
```

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

```
Border# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 102, main routing table version 102
6 network entries using 1824 bytes of memory
8 path entries using 1088 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
20 BGP extended community entries using 2706 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7362 total bytes of memory
BGP activity 133/39 prefixes, 265/144 paths, scan interval 60 secs
8 networks peaked at 12:14:22 Aug 6 2020 UTC (1d05h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    2114    1995      102    0    0 1d05h           2
172.16.255.2    4        65001    2112    1990      102    0    0 1d05h           2
Border#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **rp mapping** command on Border VTEP:

```
Border# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
Border#
```

The following example shows the output for the **show ip routing vrf** *vrf-name* command on Border VTEP:

```
Border# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 0, type internal
  Redistributing via ospf 2
  Advertised by ospf 2 subnets
  Last update from 172.16.254.3 on Vlan901, 04:02:51 ago
  Routing Descriptor Blocks:
  * 172.16.254.3 (default), from 172.16.255.1, 04:02:51 ago, via Vlan901
      opaque_ptr 0x7FEF6836D190
      Route metric is 0, traffic share count is 1
      AS Hops 0
      MPLS label: none
Border#
```

The following example shows the output for the **show ip igmp vrf** *vrf-name* **groups** command on Border VTEP:

```
Border# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
224.0.1.40       Vlan901                  1d05h     00:01:58  172.16.254.6
Border#
```

The following example shows the output for the **show ip mroute vrf** *vrf-name* command on Border VTEP:

```
Border# 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,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 1d05h/00:03:07, RP 10.2.255.255, flags: SJgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 04:02:51/00:03:07

(10.2.255.1, 226.1.1.1), 00:09:51/00:01:02, flags: TGqx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:09:49/stopped

(10.1.102.12, 226.1.1.1), 00:10:12/00:03:09, flags: TgQx
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 00:10:12/00:03:07

(*, 224.0.1.40), 1d05h/00:03:10, RP 10.2.255.255, flags: SJCLgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 04:02:51/00:03:10
Border#
```

The following example shows the output for the **show ip mfib vrf** *vrf-name* command on Border VTEP:

```
Border# 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,
                e   - Encap helper tunnel flag.
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
   Vlan901, VXLAN Decap Flags: A IC NS
   Vlan2001 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,226.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   6/0/122/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan2001 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (10.1.102.12,226.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   304/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan2001 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (10.2.255.1,226.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 1/0/1
   HW Forwarding:   582/1/122/0, Other: 0/0/0
   Vlan2001 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
Border#
```

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

```
Border# show bgp ipv4 mvpn allBGP table version is 102, local router ID is 172.16.255.6
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: 1:1 (default for vrf green)
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 *>   [5][1:1][10.2.255.1][226.1.1.1]/18
                     0.0.0.0                            32768 ?
 *>   [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                     0.0.0.0                            32768 ?
 *>   [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                     0.0.0.0                            32768 ?
 *>i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                     0.0.0.0                            32768 ?
Border#
```

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

```
Border# 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,
       e - encap-helper tunnel flag
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), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.6, 239.1.1.1), 00:09:47/00:02:24, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:09:47/00:02:33

(172.16.254.4, 239.1.1.1), 04:26:08/00:02:10, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:26:08/00:00:51

(*, 224.0.1.40), 1d05h/00:02:56, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:56

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.4, 225.0.0.102), 1d05h/00:01:27, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.6, 225.0.0.102), 1d05h/00:01:53, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:43, A

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.3, 225.0.0.101), 1d05h/00:01:10, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
```

```
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:08
Border#
```

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

```
Border# 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,
                e   - Encap helper tunnel flag.
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
   TenGigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   8/0/146/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 7/0/125/0, Other: 0/0/0
   HW Forwarding:   12570/0/177/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/7    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/172/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   9199/0/176/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 17/0/174/0, Other: 10/9/1
   HW Forwarding:   3789/0/151/0, Other: 0/0/0
   Null0 Flags: A
```

```
    TenGigabitEthernet1/0/2 Flags: F
      Pkts: 0/0/16    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   9/0/168/0, Other: 0/0/0
    TenGigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 1/0/150/0, Other: 0/0/0
    HW Forwarding:   7961/0/167/0, Other: 0/0/0
    TenGigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 2/0/150/0, Other: 2/2/0
    HW Forwarding:   580/1/156/1, Other: 0/0/0
    Null0 Flags: A
    TenGigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
Border#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 82

Outputs to Verify the Configuration on Spine Switch 1

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

```
Spine-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 204, main routing table version 204
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7716 total bytes of memory
BGP activity 266/218 prefixes, 3029/2926 paths, scan interval 60 secs
8 networks peaked at 12:20:11 Aug 6 2020 UTC (1d05h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    1985    2115      204    0    0 1d05h           2
172.16.255.4    4        65001    1995    2111      204    0    0 1d05h           4
172.16.255.6    4        65001    1999    2118      204    0    0 1d05h           4
Spine-01#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 1:

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings
```

```
Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-01#
```

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

```
Spine-01# show bgp ipv4 mvpn all
BGP table version is 204, local router ID is 172.16.255.1
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: 1:1
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i  [5][1:1][10.2.255.1][226.1.1.1]/18
                      172.16.255.6             0    100      0 ?
 *>i                   172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
 * i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 * i  [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                      172.16.255.6             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Spine-01#
```

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

```
Spine-01# 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), 04:29:40/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:13:17/00:02:24, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 04:27:38/00:02:41, flags: PTA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:43, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:43

(*, 225.0.0.102), 1w0d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null
Spine-01#
```

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

```
Spine-01# 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: 83/83/0
   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
   Tunnel1 Flags: A
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 1/0/206/0, Other: 282/0/282
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/2 Flags: NS
```

```
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/4 Flags: NS
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 4/3/1
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   7/0/158/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/4 Flags: NS
Spine-01#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 82

Outputs to Verify the Configuration on Spine Switch 2

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

```
Spine-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 164, main routing table version 164
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7716 total bytes of memory
BGP activity 297/249 prefixes, 3131/3028 paths, scan interval 60 secs
8 networks peaked at 12:20:59 Aug 6 2020 UTC (1d05h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    1988    2114      164    0    0 1d05h           2
172.16.255.4    4        65001    1998    2110      164    0    0 1d05h           4
172.16.255.6    4        65001    1996    2119      164    0    0 1d05h           4
Spine-02#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 2:

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
```

```
    RP: 172.16.255.255 (?)
Spine-02#
```

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

```
Spine-02# show bgp ipv4 mvpn all
BGP table version is 164, local router ID is 172.16.255.2
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: 1:1
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i  [5][1:1][10.2.255.1][226.1.1.1]/18
                      172.16.255.6             0    100      0 ?
 *>i                   172.16.255.6             0    100      0 ?
 *>i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
 *>i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
 * i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 * i  [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                      172.16.255.6             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Spine-02#
```

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

```
Spine-02# 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), 3d12h/00:03:14, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:31
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:14
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:09

(172.16.254.6, 239.1.1.1), 00:15:48/00:01:26, flags: T
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:15:48/00:03:24
    GigabitEthernet1/0/2, Forward/Sparse, 00:15:48/00:03:26

(172.16.254.4, 239.1.1.1), 04:32:09/00:01:28, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 04:32:09/00:03:09
    GigabitEthernet1/0/1, Forward/Sparse, 04:32:09/00:03:14

(*, 224.0.1.40), 1w0d/00:03:29, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:48
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:29
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:17
    Loopback2, Forward/Sparse, 1w0d/00:02:34

(*, 225.0.0.102), 1w0d/00:03:28, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:55
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:00
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:28

(172.16.254.4, 225.0.0.102), 1d05h/00:02:09, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:28
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:17

(172.16.254.6, 225.0.0.102), 1d05h/00:01:40, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:59
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:05

(*, 225.0.0.101), 3d12h/00:03:21, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:33
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:21
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:02:47

(172.16.254.3, 225.0.0.101), 1d05h/00:02:05, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:57
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:02:47
Spine-02#
```

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

```
Spine-02# 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
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 9/0/112/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 4/0/132/0, Other: 0/0/0
   HW Forwarding:   12607/0/177/0, Other: 0/0/0
   GigabitEthernet1/0/1 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 27/0/101/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   9232/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
```

```
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   3789/0/163/0, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 10/0/150/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/4    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/4    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/4    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   8144/0/167/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   942/1/168/1, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
Spine-02#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 82

Example: Configuring TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

This example shows how to configure and verify Layer 3 TRM with PIM-SM for IPv4 and IPv6 multicast traffic when the RP is inside the BGP EVPN VXLAN fabric. The example uses the topology in the TRM with PIM-SM when the RP is inside the BGP EVPN VXLAN fabric figure.

The topology shows an EVPN VXLAN network, with two spine switches and three VTEPs, connected to an external network with three routers. VTEP 1 inside the BGP EVPN VXLAN fabric acts as the RP in this topology and Border VTEP connects the fabric to the external network through Router 1. The IPv4 multicast group is 226.1.1.1 and the IPv6 multicast group is FF06:1::1 in this topology. The following tables provide sample configurations for the devices in this topology:

Table 7: Configuring VTEP 1, Border VTEP, and VTEP 2 to Configure TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

VTEP 1	Border VTEP	VTEP 2
Leaf-01# **show running-config** hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !	Border# **show running-config** hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !	Leaf-02# **show running-config** hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !

VTEP 1	Border VTEP	VTEP 2
interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::255/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.1 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::1/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable	vlan 2001 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.4 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::4/128 ipv6 enable ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/5 switchport trunk allowed vlan 2001 switchport mode trunk ! interface TenGigabitEthernet1/0/10 switchport access vlan 102 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable !	interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.2 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::2/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable

VTEP 1	Border VTEP	VTEP 2
!	interface Vlan102	
interface Vlan102	vrf forwarding green	!
vrf forwarding green	ip address 10.1.102.1 255.255.255.0	interface Vlan901
ip address 10.1.102.1 255.255.255.0	ip pim sparse-mode	vrf forwarding green
ip pim sparse-mode	ipv6 address FC00:1:102::1/64	ip unnumbered Loopback1
ipv6 address FC00:1:102::1/64	ipv6 enable	ip pim sparse-mode
ipv6 enable	!	ipv6 enable
!	interface Vlan901	no autostate
interface Vlan901	vrf forwarding green	!
vrf forwarding green	ip unnumbered Loopback1	interface nve1
ip unnumbered Loopback1	ip pim sparse-mode	no ip address
ip pim sparse-mode	ipv6 enable	source-interface Loopback1
ipv6 enable	no autostate	host-reachability protocol bgp
no autostate	!	member vni 10101 mcast-group
!	interface Vlan2001	225.0.0.101
interface nve1	vrf forwarding green	member vni 50901 vrf green
no ip address	ip address 10.2.1.1 255.255.255.0	member vni 10102 mcast-group
source-interface Loopback1	ip mtu 1500	225.0.0.102
host-reachability protocol bgp	ip pim sparse-mode	!
member vni 10101 mcast-group	ip ospf network point-to-point	router ospf 1
225.0.0.101	ip ospf 2 area 0	router-id 172.16.255.4
member vni 50901 vrf green	ipv6 address FC00:2:1::1/64	!
member vni 10102 mcast-group	ipv6 enable	router bgp 65001
225.0.0.102	ipv6 mtu 1500	bgp log-neighbor-changes
!	ospfv3 network point-to-point	no bgp default ipv4-unicast
router ospf 1	ospfv3 1 ipv6 area 0	neighbor 172.16.255.1 remote-as 65001
router-id 172.16.255.3	!	neighbor 172.16.255.1 update-source
!	interface nve1	Loopback0
router bgp 65001	no ip address	neighbor 172.16.255.2 remote-as 65001
bgp log-neighbor-changes	source-interface Loopback1	neighbor 172.16.255.2 update-source
no bgp default ipv4-unicast	host-reachability protocol bgp	Loopback0
neighbor 172.16.255.1 remote-as 65001	member vni 10101 mcast-group	!
neighbor 172.16.255.1 update-source	225.0.0.101	address-family ipv4
Loopback0	member vni 50901 vrf green	redistribute connected
neighbor 172.16.255.2 remote-as 65001	member vni 10102 mcast-group	redistribute static
neighbor 172.16.255.2 update-source	225.0.0.102	exit-address-family
Loopback0	!	!
!	router ospfv3 1	address-family ipv4 mvpn
address-family ipv4	!	neighbor 172.16.255.1 activate
redistribute connected	address-family ipv6 unicast vrf green	neighbor 172.16.255.1 send-community
redistribute static	redistribute bgp 65001	both
exit-address-family	exit-address-family	neighbor 172.16.255.2 activate
!	!	neighbor 172.16.255.2 send-community
address-family ipv4 mvpn	router ospf 2 vrf green	both
neighbor 172.16.255.1 activate	redistribute bgp 65001	exit-address-family
neighbor 172.16.255.1 send-community	!	!
both	router ospf 1	address-family ipv6 mvpn
neighbor 172.16.255.2 activate	router-id 172.16.255.6	neighbor 172.16.255.1 activate
neighbor 172.16.255.2 send-community	!	neighbor 172.16.255.1 send-community
both	router bgp 65001	both
exit-address-family	bgp log-neighbor-changes	neighbor 172.16.255.2 activate
!	no bgp default ipv4-unicast	neighbor 172.16.255.2 send-community
	neighbor 172.16.255.1 remote-as 65001	both
	neighbor 172.16.255.1 update-source	exit-address-family
	Loopback0	
	neighbor 172.16.255.2 remote-as 65001	
	neighbor 172.16.255.2 update-source	
	Loopback0	

VTEP 1	Border VTEP	VTEP 2
address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-01#	! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static redistribute ospf 2 match internal external 1 external 2 exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute ospf 1 include-connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ! end ! Border#	! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-02#

Table 8: Configuring Spine Switch 1 and Spine Switch 2 to Configure TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

Spine Switch 1	Spine Switch 2
Spine-01# **show running-config** hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 !	Spine-02# **show running-config** hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 !

Spine Switch 1	Spine Switch 2
address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01#	address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02#

Table 9: Configuring Router 1, Router 2, and Router 3 to Configure TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

Router 1	Router 2	Router 3
R1# **show running-config** hostname R1 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::1/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ipv6 address FC00:2:1::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 !	R2# **show running-config** hostname R2 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ipv6 address FC00:2:255::2/128 ipv6 enable ipv6 mld join-group FF06:1::1 ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.2 ! ip pim rp-address 10.2.255.255	R3# **show running-config** hostname R3 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::3/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 !

Router 1	Router 2	Router 3
router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R1#	! ipv6 pim rp-address FC00:2:255::255 ! end ! R2#	ipv6 pim rp-address FC00:2:255::255 ! end ! R3#

Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric

The following sections provide sample outputs for **show** commands to verify TRM with PIM-SM on the devices in the topology configured above:

- Outputs to Verify the Configuration on VTEP 1
- Outputs to Verify the Configuration on VTEP 2
- Outputs to Verify the Configuration on Border VTEP
- Outputs to Verify the Configuration on Spine Switch 1
- Outputs to Verify the Configuration on Spine Switch 2

Outputs to Verify the Configuration on VTEP 1 (RP Inside the BGP EVPN VXLAN Fabric)

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

```
Leaf-01# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 1d05h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 1d05h
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  1d05h
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  1d05h
Leaf-01#
```

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

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10102    172.16.254.4            7          10102    1d05h
nve1      10102    172.16.254.6            5          10102    1d05h
Leaf-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on VTEP 1:

```
Leaf-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 60, main routing table version 60
5 network entries using 1960 bytes of memory
8 path entries using 1280 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
18 BGP extended community entries using 2396 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7068 total bytes of memory
BGP activity 139/41 prefixes, 275/138 paths, scan interval 60 secs
5 networks peaked at 15:46:09 Aug 6 2020 UTC (1d02h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    2135    2003       60    0    0 1d05h           3
172.16.255.2    4        65001    2131    2003       60    0    0 1d05h           3
Leaf-01#
```

The following example shows the output for the **show ipv6 pim vrf** *vrf-name* **group-map** command on VTEP 1:

```
Leaf-01# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Tu7,FC00:2:255::255 (us)
    Info source: Static
    Uptime: 1d02h, Groups: 1
Leaf-01#
```

The following example shows the output for the **show ipv6 routing vrf** command on VTEP 1:

```
Leaf-01# show ipv6 routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
      Last updated 04:21:51 ago
Leaf-01#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 1:

```
Leaf-01# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan101
   1d02h     00:02:28
Leaf-01#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 1:

```
Leaf-01# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d02h/00:03:13, RP FC00:2:255::255, flags: SCJG
  Incoming interface: Tunnel7
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    Vlan101, Forward, 1d02h/00:03:13
    Vlan901, Forward, 04:21:51/never

(FC00:1:102::12, FF06:1::1), 00:02:17/00:03:04, flags: SJTg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:02:13/00:03:23

(FC00:2:255::1, FF06:1::1), 00:01:24/00:03:04, flags: SJTg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:01:20/00:03:13
Leaf-01#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 1:

```
Leaf-01# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF00::/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 412/412/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel7 Flags: NS
```

```
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding:   4/0/126/0, Other: 0/0/0
  Tunnel7 Flags: A NS
  Vlan101 Flags: F NS
    Pkts: 0/0/2    Rate: 0 pps
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/2    Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding:   64/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan101 Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding:   38/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan101 Flags: F NS
    Pkts: 0/0/2    Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
```

```
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFD2::/16) Flags:
```

```
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFE0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFE2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFF0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFF2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 1:

```
Leaf-01# show bgp ipv6 mvpn all
BGP table version is 60, local router ID is 172.16.255.3
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: 1:1 (default for vrf green)
 * i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
                     172.16.255.6             0    100      0 ?
 *>i                  172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 *>   [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                     ::                                    32768 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                     ::                                    32768 ?
Leaf-01#
```

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

```
Leaf-01# 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,
       e - encap-helper tunnel flag
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), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(172.16.254.3, 239.1.1.1), 00:02:17/00:02:05, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0, Registering
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:02:17/00:03:09, A

(172.16.254.6, 239.1.1.1), 00:28:47/00:02:22, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:28:47/00:01:12

(172.16.254.4, 239.1.1.1), 04:45:08/00:01:03, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:45:08/00:02:51

(*, 224.0.1.40), 1d05h/00:02:38, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:38

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(172.16.254.4, 225.0.0.102), 1d05h/00:02:33, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:00:56

(172.16.254.6, 225.0.0.102), 1d05h/00:01:12, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(172.16.254.3, 225.0.0.101), 1d05h/00:03:17, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:03:17
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
```

```
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/114/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 13/0/127/0, Other: 2/2/0
   HW Forwarding:   12686/0/165/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/172/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   9299/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   3817/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 4/4/0
   HW Forwarding:   15/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 6/5/1
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Null0 Flags: A NS
   GigabitEthernet1/0/2 Flags: F
     Pkts: 0/0/0    Rate: 0 pps
```

```
   Tunnel4 Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   8525/0/167/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 2/0/150/0, Other: 0/0/0
   HW Forwarding:   1629/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
Leaf-01#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 115

Outputs to Verify the Configuration on VTEP 2

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

```
Leaf-02# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 1d05h
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 1d05h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 1d05h
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  1d05h
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  1d05h
Leaf-02#
```

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

```
Leaf-02# show l2vpn evpn peers vxlan

Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            6          10101    1d05h
nve1      10102    172.16.254.6            5          10102    1d05h
Leaf-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on VTEP 2:

```
Leaf-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 85, main routing table version 85
6 network entries using 2352 bytes of memory
8 path entries using 1280 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
18 BGP extended community entries using 2396 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7772 total bytes of memory
```

```
BGP activity 145/47 prefixes, 249/117 paths, scan interval 60 secs
6 networks peaked at 15:50:41 Aug 6 2020 UTC (1d02h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    2143    2019       85    0    0 1d05h           2
172.16.255.2    4        65001    2139    2019       85    0    0 1d05h           2
Leaf-02#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **group-map** command on VTEP 2:

```
Leaf-02# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Vl901,::FFFF:172.16.254.3
    Info source: Static
    Uptime: 1d05h, Groups: 1
Leaf-02#
```

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

```
Leaf-02# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 0, type internal
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.3%default, Vlan901%default
      From AC10:FF01::
      opaque_ptr 0x7F65BA333EC0
      Last updated 04:26:58 ago
Leaf-02#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 2:

```
Leaf-02# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan102
   1d05h     00:03:53
Leaf-02#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 2:

```
Leaf-02# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
```

```
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d05h/never, RP FC00:2:255::255, flags: SCJg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Immediate Outgoing interface list:
    Vlan102, Forward, 1d05h/never

(FC00:1:102::12, FF06:1::1), 00:07:24/00:03:28, flags: SFJTGq
  Incoming interface: Vlan102
  RPF nbr: FE80::46D3:CAFF:FE28:6CC5
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:07:24/never

(FC00:2:255::1, FF06:1::1), 00:06:31/00:00:32, flags: SJTgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Inherited Outgoing interface list:
    Vlan102, Forward, 1d05h/never
Leaf-02#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 2:

```
Leaf-02# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF00::/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF00::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF02::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 10/10/0
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   3/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan102 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:102::12,FF06:1::1) Flags: HW
   SW Forwarding: 2/0/100/0, Other: 0/0/0
   HW Forwarding:   217/0/118/0, Other: 0/0/0
   Vlan102 Flags: A F
     Pkts: 0/0/0    Rate: 0 pps
```

```
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/1    Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding:   191/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan102 Flags: F NS
    Pkts: 0/0/2    Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF42::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF50::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF52::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF60::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF62::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF70::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF72::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF80::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF82::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF90::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF92::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFA0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFA2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFB0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFB2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFC0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFC2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFD0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFD2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFE0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFE2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFF0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFF2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 2:

```
Leaf-02# show bgp ipv6 mvpn all
BGP table version is 85, local router ID is 172.16.255.4
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: 1:1 (default for vrf green)
 *>   [5][1:1][FC00:1:102::12][FF06:1::1]/42
                       ::                                    32768 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
                       172.16.255.6             0    100      0 ?
 *>i                    172.16.255.6             0    100      0 ?
 *>   [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                       ::                                    32768 ?
 *>i  [7][1:1][65001][FC00:1:102::12][FF06:1::1]/46
                       172.16.255.3             0    100      0 ?
 *>   [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                       ::                                    32768 ?
Route Distinguisher: 172.16.254.4:102
 * i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                       172.16.255.3             0    100      0 ?
 *>i                    172.16.255.3             0    100      0 ?
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
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), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.6, 239.1.1.1), 00:33:54/00:01:36, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:33:54/00:02:05

(172.16.254.4, 239.1.1.1), 04:50:15/00:03:03, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
```

```
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 04:50:15/00:03:29

(*, 224.0.1.40), 1d05h/00:02:01, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:01

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.6, 225.0.0.102), 1d05h/00:02:05, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.4, 225.0.0.102), 1d05h/00:02:29, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:03:28

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.3, 225.0.0.101), 1d05h/00:01:04, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
```

```
    Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/170/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   12630/0/177/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/224/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 2/0/163/0, Other: 3/1/2
   HW Forwarding:   9373/0/164/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/206/0, Other: 0/0/0
   HW Forwarding:   3825/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   9/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 24/20/4
   HW Forwarding:   8667/0/156/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 2/0/150/0, Other: 0/0/0
   HW Forwarding:   1781/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/2    Rate: 0 pps
Leaf-02#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 115

Outputs to Verify the Configuration on Border VTEP

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

```
Border# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 1d06h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 1d06h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 1d06h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 1d06h
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  1d06h
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  1d05h
Border#
```

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

```
Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            6          10101    1d06h
nve1      10102    172.16.254.4            7          10102    1d05h
Border#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Border VTEP:

```
Border# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 85, main routing table version 85
5 network entries using 1960 bytes of memory
7 path entries using 1120 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
20 BGP extended community entries using 2706 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7530 total bytes of memory
BGP activity 137/41 prefixes, 272/148 paths, scan interval 60 secs
5 networks peaked at 15:42:39 Aug 6 2020 UTC (1d02h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    2158    2031       85    0    0 1d06h           2
172.16.255.2    4        65001    2157    2025       85    0    0 1d06h           2
Border#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **group-map** command on Border VTEP:

```
Border# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Vl901,::FFFF:172.16.254.3
    Info source: Static
    Uptime: 1d06h, Groups: 1
Border#
```

The following example shows the output for the **show ip routing vrf** *vrf-name* command on Border VTEP:

```
Border# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 0, type internal
  Redistributing via ospf 1
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.3%default, Vlan901%default
      From AC10:FF01::
      opaque_ptr 0x7FEF699AEC28
      Last updated 04:34:38 ago
Border#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on Border VTEP:

```
Border# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan102
   1d05h     00:02:29
Border#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on Border VTEP:

```
Border# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d05h/00:02:52, RP FC00:2:255::255, flags: SCg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Immediate Outgoing interface list:
    Vlan102, Null, 1d05h/never
    Vlan2001, Forward, 04:34:39/00:02:52

(FC00:1:102::12, FF06:1::1), 00:15:05/00:02:32, flags: STgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan2001, Forward, 00:15:03/00:02:32
  Inherited Outgoing interface list:
    Vlan102, Null, 1d05h/never

(FC00:2:255::1, FF06:1::1), 00:14:13/00:02:52, RP FC00:2:255::255, flags: SPR
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Immediate Outgoing interface list:
    Vlan2001, Null, 00:14:13/00:02:52
  Inherited Outgoing interface list:
    Vlan102, Null, 1d05h/never
```

```
(FC00:2:255::1, FF06:1::1), 00:14:12/never, flags: STGq
  Incoming interface: Vlan2001
  RPF nbr: FE80::A2B4:39FF:FE21:9183
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:14:12/never
  Inherited Outgoing interface list:
    Vlan102, Null, 1d05h/never
Border#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on Border VTEP:

```
Border# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF00::/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF00::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF02::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 12/12/0
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 4/4/0
   HW Forwarding:   7/0/122/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan2001 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:102::12,FF06:1::1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   450/0/125/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan2001 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:2:255::1,FF06:1::1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 2/1/1
   HW Forwarding:   423/0/122/0, Other: 0/0/0
   Vlan2001 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (*,FF10::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF12::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF20::/15) Flags: HW
```

```
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
```

```
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF72::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF80::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF82::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FF90::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FF92::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFA0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFA2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFB0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFB2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFC0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFC2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFD0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFD2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFE0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFE2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
  (*,FFF0::/15) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,FFF2::/16) Flags:
    SW Forwarding: 0/0/0/0, Other: 0/0/0
Border#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Border VTEP:

```
Border# show bgp ipv6 mvpn all
BGP table version is 85, local router ID is 172.16.255.6
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: 1:1 (default for vrf green)
 * i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                      172.16.255.4             0    100      0 ?
```

```
 *>i                   172.16.255.4             0    100      0 ?
 *>   [5][1:1][FC00:2:255::1][FF06:1::1]/42
                       ::                                    32768 ?
 *>   [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                       ::                                    32768 ?
 * i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                      172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                       ::                                    32768 ?
Border#
```

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

```
Border# 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,
       e - encap-helper tunnel flag
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), 1d06h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.6, 239.1.1.1), 00:41:35/00:02:45, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:41:35/00:03:11

(172.16.254.4, 239.1.1.1), 04:57:56/00:02:37, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:57:56/00:02:03

(*, 224.0.1.40), 1d06h/00:02:10, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d06h/00:02:10

(*, 225.0.0.102), 1d06h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.4, 225.0.0.102), 1d06h/00:01:56, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
```

```
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.6, 225.0.0.102), 1d06h/00:02:16, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:21, A

(*, 225.0.0.101), 1d06h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.3, 225.0.0.101), 1d06h/00:02:00, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:20
Border#
```

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

```
Border# 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,
                e   - Encap helper tunnel flag.
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
   TenGigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   8/0/146/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 7/0/125/0, Other: 0/0/0
   HW Forwarding:   12768/0/177/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/7    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/172/0, Other: 0/0/0
```

```
    TenGigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,225.0.0.102) Flags: HW
    SW Forwarding: 1/0/154/0, Other: 0/0/0
    HW Forwarding:   9363/0/176/0, Other: 0/0/0
    TenGigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 17/0/174/0, Other: 10/9/1
    HW Forwarding:   3858/0/151/0, Other: 0/0/0
    Null0 Flags: A
    TenGigabitEthernet1/0/2 Flags: F
      Pkts: 0/0/16    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   10/0/168/0, Other: 0/0/0
    TenGigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 1/0/150/0, Other: 0/0/0
    HW Forwarding:   8909/0/167/0, Other: 0/0/0
    TenGigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 2/0/150/0, Other: 2/2/0
    HW Forwarding:   2018/0/156/0, Other: 0/0/0
    Null0 Flags: A
    TenGigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
Border#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 115

Outputs to Verify the Configuration on Spine Switch 1

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Spine Switch 1:

```
Spine-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 78, main routing table version 78
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7756 total bytes of memory
BGP activity 270/220 prefixes, 3041/2934 paths, scan interval 60 secs
5 networks peaked at 15:48:28 Aug 6 2020 UTC (1d02h ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
```

```
172.16.255.3    4        65001    2020    2157       78    0    0 1d06h           2
172.16.255.4    4        65001    2030    2154       78    0    0 1d06h           3
172.16.255.6    4        65001    2033    2160       78    0    0 1d06h           3
Spine-01#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 1:

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Spine Switch 1:

```
Spine-01# show bgp ipv6 mvpn all
BGP table version is 78, local router ID is 172.16.255.1
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: 1:1
 * i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
                     172.16.255.6             0    100      0 ?
 *>i                  172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                     172.16.255.6             0    100      0 ?
 * i                  172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                     172.16.255.4             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 * i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                     172.16.255.6             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Spine-01#
```

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

```
Spine-01# 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), 04:59:49/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:43:26/00:02:24, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 04:57:47/00:01:01, flags: PTA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:32, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:32

(*, 225.0.0.102), 1w0d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 225.0.0.102), 02:11:00/00:01:54, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 1d06h/00:02:27, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
Spine-01#
```

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

```
Spine-01# 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: 83/83/0
```

```
    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
    Tunnel1 Flags: A
    Loopback2 Flags: F IC NS
      Pkts: 0/0/0    Rate: 0 pps
  (*,225.0.0.102) Flags: C HW
    SW Forwarding: 1/0/206/0, Other: 282/0/282
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
  (172.16.254.4,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/2 Flags: NS
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/4 Flags: NS
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 6/5/1
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   8/0/157/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/4 Flags: NS
Spine-01#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 115

Outputs to Verify the Configuration on Spine Switch 2

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Spine Switch 2:

```
Spine-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 77, main routing table version 77
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7756 total bytes of memory
BGP activity 301/251 prefixes, 3143/3036 paths, scan interval 60 secs
5 networks peaked at 15:49:16 Aug 6 2020 UTC (1d02h ago)
```

```
Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    2021    2155       77    0    0 1d06h           2
172.16.255.4    4        65001    2031    2152       77    0    0 1d06h           3
172.16.255.6    4        65001    2029    2161       77    0    0 1d06h           3
Spine-02#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 2:

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Spine Switch 2:

```
Spine-02# show bgp ipv6 mvpn all
BGP table version is 77, local router ID is 172.16.255.2
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: 1:1
 * i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
                     172.16.255.6             0    100      0 ?
 *>i                  172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                     172.16.255.6             0    100      0 ?
 * i                  172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                     172.16.255.4             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 * i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                     172.16.255.6             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Spine-02#
```

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

```
Spine-02# 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), 3d13h/00:03:01, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:01
    GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:02:41
    GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:02:43

(172.16.254.6, 239.1.1.1), 00:44:52/00:02:29, flags: T
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:44:52/00:02:58
    GigabitEthernet1/0/2, Forward/Sparse, 00:44:52/00:03:02

(172.16.254.4, 239.1.1.1), 05:01:13/00:02:28, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 05:01:13/00:03:22
    GigabitEthernet1/0/1, Forward/Sparse, 05:01:13/00:02:56

(*, 224.0.1.40), 1w0d/00:03:12, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:12
    GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:02:54
    GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:02:44
    Loopback2, Forward/Sparse, 1w0d/00:02:32

(*, 225.0.0.102), 1w0d/00:03:26, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:21
    GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:03:26
    GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:02:56

(172.16.254.4, 225.0.0.102), 1d06h/00:02:18, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:03:15
    GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:03:26

(172.16.254.6, 225.0.0.102), 1d06h/00:02:40, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:28
    GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:03:28

(*, 225.0.0.101), 3d13h/00:03:13, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:02:59
    GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:02:53
    GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:03:13
```

```
(172.16.254.3, 225.0.0.101), 1d06h/00:03:09, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:27
    GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:03:13
Spine-02#
```

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

```
Spine-02# 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
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 9/0/112/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 4/0/132/0, Other: 0/0/0
   HW Forwarding:   12790/0/177/0, Other: 0/0/0
   GigabitEthernet1/0/1 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 27/0/101/0, Other: 0/0/0
```

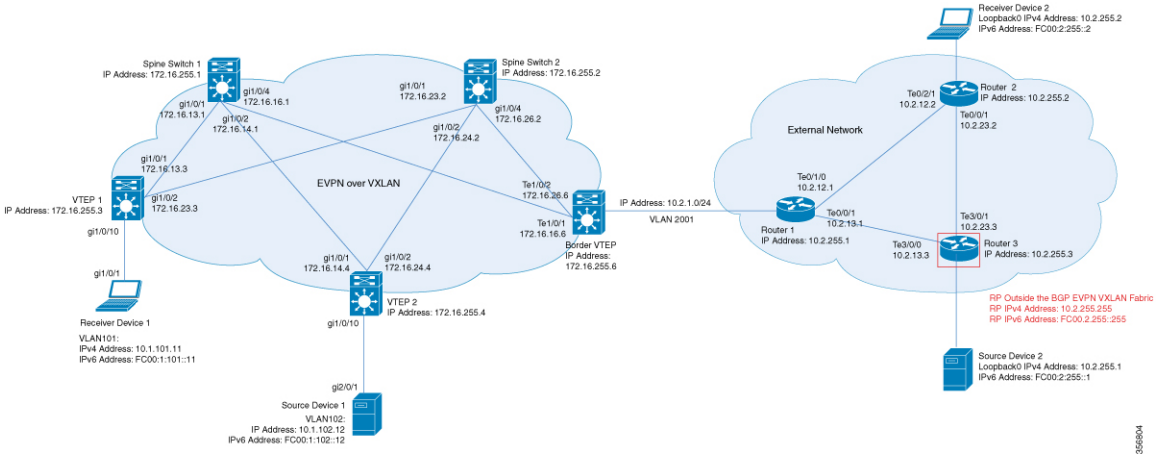
```
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   9381/0/176/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   3853/0/163/0, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 10/0/150/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/4    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/4    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/4    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   9007/0/167/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   2111/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
Spine-02#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Inside the BGP EVPN VXLAN Fabric, on page 115

Example: Configuring TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

This example shows how to configure and verify Layer 3 TRM with PIM-SM for IPv4 multicast traffic when the RP is outside the BGP EVPN VXLAN fabric. The example uses the following topology:

Figure 14: TRM with PIM-SM when the RP is Outside the BGP EVPN VXLAN Fabric



The topology shows an EVPN VXLAN network, with two spine switches and three VTEPs, connected to an external network with three routers. Router 3 in the external network acts as the RP in this topology and Border VTEP connects the fabric to the external network through Router 1. The IPv4 multicast group is 226.1.1.1 for this topology. The following tables provide sample configurations for the devices in this topology:

Table 10: Configuring VTEP 1, Border VTEP, and VTEP 2 to Configure TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

VTEP 1	Border VTEP	VTEP 2
Leaf-01# **show running-config** hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 !	Border# **show running-config** hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! vlan 2001 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 !	Leaf-02# **show running-config** hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-famil ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 !

VTEP 1	Border VTEP	VTEP 2
interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family !	interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/5 switchport trunk allowed vlan 2001 switchport mode trunk ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 2 vrf green redistribute bgp 65001	interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 102 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family !

VTEP 1	Border VTEP	VTEP 2
address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Leaf-01#	! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static redistribute ospf 2 match internal external 1 external 2 exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Border#	address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Leaf-02#

Table 11: Configuring Spine Switch 1 and Spine Switch 2 to Configure TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

Spine Switch 1

```
Spine-01# show running-config
hostname Spine-01
!
ip routing
!
ip multicast-routing
!
system mtu 9198
!
interface Loopback0
ip address 172.16.255.1 255.255.255.255
ip ospf 1 area 0
!
interface Loopback1
ip address 172.16.254.1 255.255.255.255
ip ospf 1 area 0
!
interface Loopback2
ip address 172.16.255.255 255.255.255.255
ip pim sparse-mode
ip ospf 1 area 0
!
interface GigabitEthernet1/0/1
no switchport
ip address 172.16.13.1 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/2
no switchport
ip address 172.16.14.1 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/4
no switchport
ip address 172.16.16.1 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
router ospf 1
router-id 172.16.255.1
!
router bgp 65001
bgp router-id 172.16.255.1
bgp log-neighbor-changes
no bgp default ipv4-unicast
neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0
!
```

Spine Switch 2

```
Spine-02# show running-config
hostname Spine-02
!
ip routing
!
ip multicast-routing
!
system mtu 9198
!
interface Loopback0
ip address 172.16.255.2 255.255.255.255
ip ospf 1 area 0
!
interface Loopback1
ip address 172.16.254.2 255.255.255.255
ip ospf 1 area 0
!
interface Loopback2
ip address 172.16.255.255 255.255.255.255
ip pim sparse-mode
ip ospf 1 area 0
!
interface GigabitEthernet1/0/1
no switchport
ip address 172.16.23.2 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/2
no switchport
ip address 172.16.24.2 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
interface GigabitEthernet1/0/4
no switchport
ip address 172.16.26.2 255.255.255.0
ip pim sparse-mode
ip ospf network point-to-point
ip ospf 1 area 0
!
router ospf 1
router-id 172.16.255.2
!
router bgp 65001
bgp router-id 172.16.255.2
bgp log-neighbor-changes
no bgp default ipv4-unicast
neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0
!
```

Spine Switch 1	Spine Switch 2
address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01#	address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02#

Table 12: Configuring Router 1, Router 2, and Router 3 to Configure TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

Router 1	Router 2	Router 3
R1# **show running-config** hostname R1 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! end ! R1#	R2# **show running-config** hostname R2 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.2 ! ip pim rp-address 10.2.255.255 ! end ! R2#	R3# **show running-config** hostname R3 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! end ! R3#

Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

The following sections provide sample outputs for **show** commands to verify TRM with PIM-SM on the devices in the topology configured above:

- Outputs to Verify the Configuration on VTEP 1, on page 153
- Outputs to Verify the Configuration on VTEP 2, on page 158
- Outputs to Verify the Configuration on Border VTEP, on page 163
- Outputs to Verify the Configuration on Spine Switch 1, on page 169
- Outputs to Verify the Configuration on Spine Switch 2, on page 172
- Outputs to Verify the Configuration on Router 3 (RP Outside the BGP EVPN VXLAN Fabric), on page 176

Outputs to Verify the Configuration on VTEP 1

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

```
Leaf-01# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 16:44:02
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 16:41:00
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 16:44:02
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 16:41:00
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  16:23:05
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  16:44:02
Leaf-01#
```

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

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                  Num routes eVNI     UP time
--------- -------- -----------------------  ---------- -------- --------
nve1      10102    172.16.254.4             7          10102    16:23:06
nve1      10102    172.16.254.6             5          10102    16:44:02
Leaf-01#
```

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

```
Leaf-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 58, main routing table version 58
6 network entries using 1824 bytes of memory
8 path entries using 1088 bytes of memory
3/3 BGP path/bestpath attribute entries using 936 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 6404 total bytes of memory
BGP activity 117/25 prefixes, 240/113 paths, scan interval 60 secs
6 networks peaked at 12:17:52 Aug 6 2020 UTC (16:27:28.286 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1217    1126       58    0    0 16:44:58        2
172.16.255.2    4        65001    1213    1121       58    0    0 16:44:53        2
Leaf-01#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **rp mapping** command on VTEP 1:

```
Leaf-01# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
Leaf-01#
```

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

```
Leaf-01# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 3, type internal
  Last update from 172.16.254.6 on Vlan901, 16:17:01 ago
  Routing Descriptor Blocks:
  * 172.16.254.6 (default), from 172.16.255.1, 16:17:01 ago, via Vlan901
      opaque_ptr 0x7FBB8620D990
      Route metric is 3, traffic share count is 1
      AS Hops 0
      MPLS label: none
Leaf-01#
```

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

```
Leaf-01# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface                Uptime    Expires   Last Reporter   Group Accounted
226.1.1.1        Vlan101                    13:03:08  00:02:13  10.1.101.11
224.0.1.40       Loopback901                16:45:17  00:02:50  10.1.255.1
Leaf-01#
```

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

```
Leaf-01# 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,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 13:03:08/stopped, RP 10.2.255.255, flags: SJCg
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan101, Forward/Sparse, 13:03:08/00:02:13

(10.2.255.1, 226.1.1.1), 00:08:23/00:02:54, flags: TgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:08:23/00:02:13

(10.1.102.12, 226.1.1.1), 00:08:48/00:02:24, flags: TgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:08:48/00:02:13

(*, 224.0.1.40), 16:45:17/00:02:50, RP 10.2.255.255, flags: SJCLg
```

```
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
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: 2/2/0
   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
   Vlan901, VXLAN Decap Flags: A NS
   Loopback901 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,226.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan101 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (10.1.102.12,226.1.1.1) Flags: HW
   SW Forwarding: 5/0/100/0, Other: 0/0/0
   HW Forwarding:   523/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
Leaf-01#
```

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

```
Leaf-01# show bgp ipv4 mvpn all
BGP table version is 60, local router ID is 172.16.255.6
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: 1:1 (default for vrf green)
 *>i  [5][1:1][10.1.102.12][226.1.1.1]/18
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
 *>   [5][1:1][10.2.255.1][226.1.1.1]/18
                      0.0.0.0                            32768 ?
```

```
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                     172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                     172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
 *>i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                     0.0.0.0                            32768 ?
Leaf-01#
```

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

```
Leaf-01# 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,
       e - encap-helper tunnel flag
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), 16:45:08/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 16:45:08/00:00:45

(172.16.254.4, 239.1.1.1), 00:08:47/00:01:59, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:08:47/00:00:12

(172.16.254.6, 239.1.1.1), 00:08:49/00:02:00, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:08:49/00:00:10

(*, 224.0.1.40), 16:45:17/00:02:46, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/114/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 13/0/127/0, Other: 2/2/0
   HW Forwarding:   7870/0/164/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/172/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   5222/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   2137/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   11/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 4/0/150/0, Other: 0/0/0
```

```
   HW Forwarding:   518/0/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   498/1/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
Leaf-01#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 152

Outputs to Verify the Configuration on VTEP 2

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

```
Leaf-02# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 16:56:53
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 16:56:53
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 16:56:53
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 16:56:53
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  16:56:53
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  16:56:53
Leaf-02#
```

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

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            6          10101    16:56:54
nve1      10102    172.16.254.6            5          10102    16:56:54
Leaf-02#
```

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

```
Leaf-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 62, main routing table version 62
7 network entries using 2128 bytes of memory
9 path entries using 1224 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7156 total bytes of memory
BGP activity 121/28 prefixes, 202/77 paths, scan interval 60 secs
9 networks peaked at 12:22:24 Aug 6 2020 UTC (16:43:21.423 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1229    1151       62    0    0 16:57:50        2
```

```
172.16.255.2    4        65001    1227    1152       62    0    0 16:57:51        2
Leaf-02#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **rp mapping** command on VTEP 2:

```
Leaf-02# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
Leaf-02#
```

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

```
Leaf-02# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 3, type internal
  Last update from 172.16.254.6 on Vlan901, 16:56:55 ago
  Routing Descriptor Blocks:
  * 172.16.254.6 (default), from 172.16.255.1, 16:56:55 ago, via Vlan901
      opaque_ptr 0x7F65B8B9E4B0
      Route metric is 3, traffic share count is 1
      AS Hops 0
      MPLS label: none
Leaf-02#
```

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

```
Leaf-02# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
226.1.1.1        Vlan102                  16:58:00  00:02:11  10.1.102.12
224.0.1.40       Vlan901                  16:58:37  00:02:33  172.16.254.4
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
```

```
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 16:58:00/stopped, RP 10.2.255.255, flags: SJCFg
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan102, Forward/Sparse, 16:58:00/00:02:11

(10.2.255.1, 226.1.1.1), 00:24:16/00:02:40, flags: JTgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:24:16/00:02:11

(10.1.102.12, 226.1.1.1), 00:24:41/00:02:09, flags: FTGqx
  Incoming interface: Vlan102, RPF nbr 0.0.0.0, Registering
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:24:41/stopped

(*, 224.0.1.40), 16:58:37/00:02:33, RP 10.2.255.255, flags: SJPCLgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list: Null
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   Vlan901, VXLAN Decap Flags: A IC NS
 (*,226.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   3/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan102 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (10.1.102.12,226.1.1.1) Flags: HW
   SW Forwarding: 739/0/100/0, Other: 2/2/0
   HW Forwarding:   736/0/118/0, Other: 0/0/0
   Vlan102 Flags: A
   Tunnel5 Flags: F
     Pkts: 0/0/739    Rate: 0 pps
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
```

```
     Pkts: 0/0/739    Rate: 0 pps
Leaf-02#
```

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

```
Leaf-02# show bgp ipv4 mvpn all
BGP table version is 62, local router ID is 172.16.255.4
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: 1:1 (default for vrf green)
 *>   [5][1:1][10.1.102.12][226.1.1.1]/18
                       0.0.0.0                                32768 ?
 *>i  [5][1:1][10.2.255.1][226.1.1.1]/18
                       172.16.255.6             0    100      0 ?
 * i                    172.16.255.6             0    100      0 ?
 *>   [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                       0.0.0.0                                32768 ?
 *>   [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                       0.0.0.0                                32768 ?
 *>i  [7][1:1][65001][10.1.102.12/32][226.1.1.1/32]/22
                       172.16.255.3             0    100      0 ?
 *>   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                       0.0.0.0                                32768 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                       172.16.255.3             0    100      0 ?
 * i                    172.16.255.3             0    100      0 ?
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
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), 16:58:28/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 16:58:28/00:02:25
```

```
(172.16.254.6, 239.1.1.1), 00:24:42/00:00:58, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:24:42/00:02:17

(172.16.254.4, 239.1.1.1), 00:24:42/00:03:28, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:24:42/00:03:23, A

(*, 224.0.1.40), 16:58:37/00:02:26, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 16:58:36/00:02:26
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/170/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   7870/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/224/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
```

```
    Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 2/0/163/0, Other: 3/1/2
   HW Forwarding:   5353/0/164/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/206/0, Other: 0/0/0
   HW Forwarding:   2165/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   5/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 1495/1491/4
   HW Forwarding:   742/0/156/0, Other: 0/0/0
   Null0 Flags: A NS
   GigabitEthernet1/0/2 Flags: F
    Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   1460/1/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
Leaf-02#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 152

Outputs to Verify the Configuration on Border VTEP

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

```
Border# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 17:09:20
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 17:06:19
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 17:09:20
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 17:06:19
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  17:09:20
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  16:48:24
Border#
```

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

Border VTEP

```
Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
```

```
--------- -------- ------------------------  ---------- -------- --------
nve1      10101    172.16.254.3              6          10101    17:09:21
nve1      10102    172.16.254.4              7          10102    16:48:24
Border#
```

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

```
Border# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 60, main routing table version 60
6 network entries using 1824 bytes of memory
10 path entries using 1360 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
19 BGP extended community entries using 2682 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7298 total bytes of memory
BGP activity 116/24 prefixes, 232/112 paths, scan interval 60 secs
8 networks peaked at 12:14:22 Aug 6 2020 UTC (16:52:46.174 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1246    1165       60    0    0 17:13:17        4
172.16.255.2    4        65001    1247    1161       60    0    0 17:13:14        4
Border#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **rp mapping** command on Border VTEP:

```
Border# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
Border#
```

The following example shows the output for the **show ip routing vrf** *vrf-name* command on Border VTEP:

```
Border# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "ospf 2", distance 110, metric 3, type intra area
  Redistributing via bgp 65001
  Advertised by bgp 65001 match internal external 1 & 2
  Last update from 10.2.1.2 on Vlan2001, 17:12:42 ago
  Routing Descriptor Blocks:
  * 10.2.1.2, from 10.2.255.3, 17:12:42 ago, via Vlan2001
      Route metric is 3, traffic share count is 1
Border#
```

The following example shows the output for the **show ip igmp vrf** *vrf-name* **groups** command on Border VTEP:

```
Border# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address    Interface              Uptime    Expires   Last Reporter   Group Accounted
```

```
224.0.1.40       Vlan901                 17:14:13  00:02:51  172.16.254.6
Border#
```

The following example shows the output for the **show ip mroute vrf** *vrf-name* command on Border VTEP:

```
Border# 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,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 17:06:19/stopped, RP 10.2.255.255, flags: SJGx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 17:06:19/stopped

(10.2.255.1, 226.1.1.1), 00:33:41/00:01:22, flags: TGqx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:33:41/stopped

(10.1.102.12, 226.1.1.1), 00:34:06/00:03:14, flags: Tgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 00:34:06/00:02:52, A

(*, 224.0.1.40), 17:14:13/00:02:51, RP 10.2.255.255, flags: SJCLGx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 17:14:12/00:02:51
Border#
```

The following example shows the output for the **show ip mfib vrf** *vrf-name* command on Border VTEP:

```
Border# 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,
                e   - Encap helper tunnel flag.
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
   Vlan2001 Flags: A NS
   Vlan901, VXLAN Decap Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,226.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   6/0/122/0, Other: 0/0/0
   Vlan2001 Flags: A NS
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (10.1.102.12,226.1.1.1) Flags: HW
   SW Forwarding: 4/0/100/0, Other: 1/1/0
   HW Forwarding:   2096/1/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan2001 Flags: F
     Pkts: 0/0/4    Rate: 0 pps
 (10.2.255.1,226.1.1.1) Flags: HW
   SW Forwarding: 1/0/100/0, Other: 0/0/0
   HW Forwarding:   2072/1/122/0, Other: 0/0/0
   Vlan2001 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/1    Rate: 0 pps
Border#
```

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

```
Border# show bgp ipv4 mvpn all
BGP table version is 60, local router ID is 172.16.255.6
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: 1:1 (default for vrf green)
 *>i  [5][1:1][10.1.102.12][226.1.1.1]/18
                      172.16.255.4             0    100      0 ?
 * i                    172.16.255.4             0    100      0 ?
 *>   [5][1:1][10.2.255.1][226.1.1.1]/18
                      0.0.0.0                            32768 ?
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                      172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                      172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
 *>i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                      172.16.255.3             0    100      0 ?
```

```
 * i                   172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                      0.0.0.0                                32768 ?
Border#
```

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

```
Border# 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,
       e - encap-helper tunnel flag
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), 17:14:04/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 17:14:04/00:01:48

(172.16.254.4, 239.1.1.1), 00:34:05/00:02:44, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:34:05/00:01:54

(172.16.254.6, 239.1.1.1), 00:34:07/00:03:12, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:34:07/00:02:52, A

(*, 224.0.1.40), 17:14:13/00:02:47, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 17:14:12/00:02:47
Border#
```

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

```
Border# 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,
                e   - Encap helper tunnel flag.
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
   TenGigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   8/0/146/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 7/0/125/0, Other: 0/0/0
   HW Forwarding:   8010/0/176/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/7    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/172/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   5353/0/176/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 11/0/167/0, Other: 7/6/1
   HW Forwarding:   2207/0/151/0, Other: 0/0/0
   Null0 Flags: A
   TenGigabitEthernet1/0/2 Flags: F
     Pkts: 0/0/10    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   8/0/168/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 4/0/150/0, Other: 0/0/0
   HW Forwarding:   2032/1/168/1, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 2/0/150/0, Other: 4/4/0
```

```
   HW Forwarding:   2015/1/156/1, Other: 0/0/0
   Null0 Flags: A
   TenGigabitEthernet1/0/2 Flags: F
     Pkts: 0/0/1    Rate: 0 pps
Border#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 152

Outputs to Verify the Configuration on Spine Switch 1

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

```
Spine-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 169, main routing table version 169
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7388 total bytes of memory
BGP activity 250/203 prefixes, 2984/2883 paths, scan interval 60 secs
8 networks peaked at 12:20:11 Aug 6 2020 UTC (16:59:40.011 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    1161    1252      169    0    0 17:17:09        4
172.16.255.4    4        65001    1169    1247      169    0    0 17:14:09        4
172.16.255.6    4        65001    1172    1253      169    0    0 17:20:10        2
Spine-01#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 1:

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-01#
```

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

```
Spine-01# show bgp ipv4 mvpn all
BGP table version is 169, local router ID is 172.16.255.1
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: 1:1
```

```
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.4             0    100      0 ?
 * i  [5][1:1][10.2.255.1][226.1.1.1]/18
                     172.16.255.6             0    100      0 ?
 *>i                  172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                     172.16.255.4             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 *>i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 * i                  172.16.255.4             0    100      0 ?
 *>i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 * i                  172.16.255.4             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 * i                  172.16.255.6             0    100      0 ?
Spine-01#
```

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

```
Spine-01# 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), 00:42:45/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:42:22/00:02:37, flags: PTA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 00:42:45/00:02:28, flags: PTA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:18, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:18
```

```
(*, 225.0.0.102), 6d19h/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 225.0.0.102), 05:29:52/00:02:22, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 17:12:35/00:02:03, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
Spine-01#
```

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

```
Spine-01# 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: 82/82/0
   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
   Tunnel1 Flags: A
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 1/0/206/0, Other: 279/0/279
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/2 Flags: NS
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/4 Flags: NS
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 1/0/1
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
```

```
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1224/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   GigabitEthernet1/0/4 Flags: A NS
Spine-01#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 152

Outputs to Verify the Configuration on Spine Switch 2

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

```
Spine-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 131, main routing table version 131
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7388 total bytes of memory
BGP activity 283/236 prefixes, 3089/2988 paths, scan interval 60 secs
8 networks peaked at 12:20:59 Aug 6 2020 UTC (17:02:43.558 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    1160    1252      131    0    0 17:20:09        4
172.16.255.4    4        65001    1173    1249      131    0    0 17:17:14        4
172.16.255.6    4        65001    1172    1258      131    0    0 17:23:12        2
Spine-02#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 2:

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-02#
```

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

```
Spine-02# show bgp ipv4 mvpn all
BGP table version is 131, local router ID is 172.16.255.2
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: 1:1
 * i  [5][1:1][10.1.102.12][226.1.1.1]/18
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i  [5][1:1][10.2.255.1][226.1.1.1]/18
                      172.16.255.6             0    100      0 ?
 *>i                   172.16.255.6             0    100      0 ?
 * i  [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 *>i  [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
                      172.16.255.3             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
 *>i  [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
                      172.16.255.3             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
                      172.16.255.3             0    100      0 ?
 * i                   172.16.255.3             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
Spine-02#
```

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

```
Spine-02# 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), 3d00h/00:03:23, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:23
    GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:17
    GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:02:52

(172.16.254.4, 239.1.1.1), 00:44:04/00:01:34, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 00:44:04/00:02:52
    GigabitEthernet1/0/1, Forward/Sparse, 00:44:04/00:03:17
```

```
(172.16.254.6, 239.1.1.1), 00:44:04/00:01:32, flags: T
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:44:04/00:03:17
    GigabitEthernet1/0/2, Forward/Sparse, 00:44:04/00:03:23

(*, 224.0.1.40), 1w0d/00:03:22, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:02:46
    GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:22
    GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:03:13
    Loopback2, Forward/Sparse, 1w0d/00:02:33

(*, 225.0.0.102), 1w0d/00:03:29, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:04
    GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:29
    GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:02:36

(172.16.254.4, 225.0.0.102), 17:17:08/00:02:44, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 17:17:08/00:02:37
    GigabitEthernet1/0/1, Forward/Sparse, 17:17:08/00:03:29

(172.16.254.6, 225.0.0.102), 17:23:14/00:03:21, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:04
    GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:29

(*, 225.0.0.101), 3d00h/00:03:10, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:01
    GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:10
    GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:02:40

(172.16.254.3, 225.0.0.101), 17:19:56/00:02:53, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:01
    GigabitEthernet1/0/4, Forward/Sparse, 17:19:56/00:03:02
Spine-02#
```

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

```
Spine-02# 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
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 9/0/112/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 4/0/132/0, Other: 0/0/0
   HW Forwarding:   8067/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/1 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 27/0/101/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   5404/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2214/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/4 Flags: A NS
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
```

```
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 9/0/150/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/3    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/3    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/3    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   2629/1/168/1, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/4 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   2607/1/168/1, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A
    GigabitEthernet1/0/1 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
Spine-02#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 152

Outputs to Verify the Configuration on Router 3 (RP Outside the BGP EVPN VXLAN Fabric)

The following example shows the output for the **show ip pim rp mapping** command on Router 3:

```
R3# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 10.2.255.255 (?)
R3#
```

The following example shows the output for the **show ip mroute** command on Router 3:

```
R3# 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

(*, 226.1.1.1), 2d19h/00:03:17, RP 10.2.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet0/0/0, Forward/Sparse, 17:10:20/00:03:17
    TenGigabitEthernet0/0/1, Forward/Sparse, 2d16h/00:03:11

(10.2.255.1, 226.1.1.1), 00:37:40/00:02:14, flags: PJT
  Incoming interface: TenGigabitEthernet0/0/0, RPF nbr 10.2.13.1
  Outgoing interface list: Null

(10.1.102.12, 226.1.1.1), 00:38:05/00:02:58, flags: P
  Incoming interface: TenGigabitEthernet0/0/0, RPF nbr 10.2.13.1
  Outgoing interface list: Null

(*, 224.0.1.40), 2d23h/00:03:27, RP 10.2.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback0, Forward/Sparse, 2d23h/00:02:11
    TenGigabitEthernet0/0/1, Forward/Sparse, 2d19h/00:03:26
    TenGigabitEthernet0/0/0, Forward/Sparse, 2d19h/00:03:27
R3#
```

Return to Verifying TRM with PIM-SM for IPv4 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 152

Example: Configuring TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when RP is Outside the BGP EVPN VXLAN Fabric

This example shows how to configure and verify Layer 3 TRM with PIM-SM for IPv4 and IPv6 multicast traffic when the RP is outside the BGP EVPN VXLAN fabric. The example uses the topology in the TRM with PIM-SM when the RP is Outside the BGP EVPN VXLAN Fabric figure.

The topology shows an EVPN VXLAN network, with two spine switches and three VTEPs, connected to an external network with three routers. Router 3 in the external network acts as the RP in this topology and Border VTEP connects the fabric to the external network through Router 1. The IPv4 multicast group is 226.1.1.1 and the IPv6 multicast group is FF06:1::1 in this topology. The following tables provide sample configurations for the devices in this topology:

Table 13: Configuring VTEP 1, Border VTEP, and VTEP 2 to Configure TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

VTEP 1	Border VTEP	VTEP 2
Leaf-01# **show running-config** hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901	Border# **show running-config** hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !	Leaf-02# **show running-config** hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !

VTEP 1	Border VTEP	VTEP 2
!	vlan 2001	
interface Loopback0	!	interface Loopback0
ip address 172.16.255.3	interface Loopback0	ip address 172.16.255.4
255.255.255.255	ip address 172.16.255.6	255.255.255.255
ip pim sparse-mode	255.255.255.255	ip pim sparse-mode
ip ospf 1 area 0	ip pim sparse-mode	ip ospf 1 area 0
!	ip ospf 1 area 0	!
interface Loopback1	!	interface Loopback1
ip address 172.16.254.3	interface Loopback1	ip address 172.16.254.4
255.255.255.255	ip address 172.16.254.6	255.255.255.255
ip pim sparse-mode	255.255.255.255	ip pim sparse-mode
ip ospf 1 area 0	ip pim sparse-mode	ip ospf 1 area 0
!	ip ospf 1 area 0	!
interface Loopback901	!	interface Loopback901
vrf forwarding green	interface Loopback901	vrf forwarding green
ip address 10.1.255.1 255.255.255.255	vrf forwarding green	ip address 10.1.255.2 255.255.255.255
ip pim sparse-mode	ip address 10.1.255.4 255.255.255.255	ip pim sparse-mode
ipv6 address FC00:1:255::1/128	ip pim sparse-mode	ipv6 address FC00:1:255::2/128
ipv6 enable	ipv6 address FC00:1:255::4/128	ipv6 enable
!	ipv6 enable	!
interface GigabitEthernet1/0/1	!	interface GigabitEthernet1/0/1
no switchport	interface TenGigabitEthernet1/0/1	no switchport
ip address 172.16.13.3 255.255.255.0	no switchport	ip address 172.16.14.4 255.255.255.0
ip pim sparse-mode	ip address 172.16.16.6 255.255.255.0	ip pim sparse-mode
ip ospf network point-to-point	ip pim sparse-mode	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf network point-to-point	ip ospf 1 area 0
!	ip ospf 1 area 0	!
interface GigabitEthernet1/0/2	!	interface GigabitEthernet1/0/2
no switchport	interface TenGigabitEthernet1/0/2	no switchport
ip address 172.16.23.3 255.255.255.0	no switchport	ip address 172.16.24.4 255.255.255.0
ip pim sparse-mode	ip address 172.16.26.6 255.255.255.0	ip pim sparse-mode
ip ospf network point-to-point	ip pim sparse-mode	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf network point-to-point	ip ospf 1 area 0
!	ip ospf 1 area 0	!
interface GigabitEthernet1/0/10	!	interface GigabitEthernet1/0/10
switchport access vlan 101	interface TenGigabitEthernet1/0/5	switchport access vlan 101
switchport mode access	switchport trunk allowed vlan 2001	switchport mode access
!	switchport mode trunk	!
interface Vlan101	!	interface Vlan101
vrf forwarding green	interface TenGigabitEthernet1/0/10	vrf forwarding green
ip address 10.1.101.1 255.255.255.0	switchport access vlan 102	ip address 10.1.101.1 255.255.255.0
ip pim sparse-mode	switchport mode access	ip pim sparse-mode
ipv6 address FC00:1:101::1/64	!	ipv6 address FC00:1:101::1/64
ipv6 enable	interface Vlan101	ipv6 enable
!	vrf forwarding green	!
interface Vlan102	ip address 10.1.101.1 255.255.255.0	interface Vlan102
vrf forwarding green	ip pim sparse-mode	vrf forwarding green
ip address 10.1.102.1 255.255.255.0	ipv6 address FC00:1:101::1/64	ip address 10.1.102.1 255.255.255.0
ip pim sparse-mode	ipv6 enable	ip pim sparse-mode
ipv6 address FC00:1:102::1/64	!	ipv6 address FC00:1:102::1/64
ipv6 enable	interface Vlan102	ipv6 enable
!	vrf forwarding green	!
interface Vlan901	ip address 10.1.102.1 255.255.255.0	interface Vlan901
vrf forwarding green	ip pim sparse-mode	vrf forwarding green
ip unnumbered Loopback1	ipv6 address FC00:1:102::1/64	ip unnumbered Loopback1
ip pim sparse-mode	ipv6 enable	ip pim sparse-mode
ipv6 enable	!	ipv6 enable
no autostate		no autostate
!		!

VTEP 1	Border VTEP	VTEP 2
interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family !	interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ipv6 address FC00:2:1::1/64 ipv6 enable ipv6 mtu 1500 ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospfv3 1 ! address-family ipv6 unicast vrf green redistribute bgp 65001 exit-address-family ! router ospf 2 vrf green redistribute bgp 65001 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0	interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family !

VTEP 1	Border VTEP	VTEP 2
address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-01#	! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static redistribute ospf 2 match internal external 1 external 2 exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute ospf 1 include-connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ! end ! Border#	address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-02#

Table 14: Configuring Spine Switch 1 and Spine Switch 2 to Configure TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

Spine Switch 1	Spine Switch 2

Spine Switch 1	Spine Switch 2
Spine-01# **show running-config** hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! address-family ipv4 exit-address-family !	Spine-02# **show running-config** hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! address-family ipv4 exit-address-family !

Spine Switch 1	Spine Switch 2
address-family ipv4 mvpn neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01#	address-family ipv4 mvpn neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02#

Table 15: Configuring Router 1, Router 2, and Router 3 to Configure TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

Router 1	Router 2	Router 3
R1# **show running-config** hostname R1 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::1/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ipv6 address FC00:2:1::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0	R2# **show running-config** hostname R2 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ipv6 address FC00:2:255::2/128 ipv6 enable ipv6 mld join-group FF06:1::1 ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.2	R3# **show running-config** hostname R3 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::3/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface Loopback255 ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::255/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 !

Router 1	Router 2	Router 3
! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R1#	! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R2#	address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R3#

Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric

The following sections provide sample outputs for **show** commands to verify TRM with PIM-SM on the devices in the topology configured above:

- Outputs to Verify the Configuration on VTEP 1, on page 186
- Outputs to Verify the Configuration on VTEP 2, on page 194
- Outputs to Verify the Configuration on Border VTEP, on page 201
- Outputs to Verify the Configuration on Spine Switch 1, on page 209
- Outputs to Verify the Configuration on Spine Switch 2, on page 212
- Outputs to Verify the Configuration on Router 3 (RP Outside the BGP EVPN VXLAN Fabric), on page 216

Outputs to Verify the Configuration on VTEP 1

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

```
Leaf-01# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 1d01h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 1d01h
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 1d01h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 1d01h
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  1d00h
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  1d01h
Leaf-01#
```

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

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
```

```
--------- -------- ------------------------  ---------- -------- --------
nve1      10102    172.16.254.4              7          10102    1d00h
nve1      10102    172.16.254.6              5          10102    1d01h
Leaf-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on VTEP 1:

```
Leaf-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 43, main routing table version 43
5 network entries using 1960 bytes of memory
7 path entries using 1120 bytes of memory
3/3 BGP path/bestpath attribute entries using 936 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 6572 total bytes of memory
BGP activity 124/30 prefixes, 253/123 paths, scan interval 60 secs
5 networks peaked at 15:46:09 Aug 6 2020 UTC (21:27:07.275 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1796    1688       43    0    0 1d01h           2
172.16.255.2    4        65001    1795    1685       43    0    0 1d01h           2
Leaf-01#
```

The following example shows the output for the **show ipv6 pim vrf** *vrf-name* **group-map** command on VTEP 1:

```
Leaf-01# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Vl901,::FFFF:172.16.254.6
    Info source: Static
    Uptime: 21:43:02, Groups: 1
Leaf-01#
```

The following example shows the output for the **show ipv6 routing vrf** command on VTEP 1:

```
Leaf-01# show ipv6 routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 2, type internal
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.6%default, Vlan901%default
      From AC10:FF01::
      opaque_ptr 0x7FBB863DE268
      Last updated 1d00h ago
Leaf-01#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 1:

```
Leaf-01# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan101
   21:30:55  00:03:57
Leaf-01#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 1:

```
Leaf-01# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 21:30:55/00:03:08, RP FC00:2:255::255, flags: SCJg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan101, Forward, 21:30:55/00:03:08

(FC00:1:102::12, FF06:1::1), 00:01:55/00:01:34, flags: SJTgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:01:55/00:02:38

(FC00:2:255::1, FF06:1::1), 00:01:14/00:02:15, flags: SJTgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:01:14/00:03:18
Leaf-01#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 1:

```
Leaf-01# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF00::/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 412/412/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF00::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF02::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   4/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan101 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:102::12,FF06:1::1) Flags: HW
   SW Forwarding: 3/0/100/0, Other: 0/0/0
   HW Forwarding:   58/0/125/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan101 Flags: F NS
     Pkts: 0/0/3    Rate: 0 pps
 (FC00:2:255::1,FF06:1::1) Flags: HW
   SW Forwarding: 1/0/100/0, Other: 0/0/0
   HW Forwarding:   36/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan101 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,FF10::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF12::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF20::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF22::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF30::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF32::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF33::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF34::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF35::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF36::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF37::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF38::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF39::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
 (*,FFD0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFD2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFE0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFE2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFF0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFF2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 1:

```
Leaf-01# show bgp ipv6 mvpn all
BGP table version is 43, local router ID is 172.16.255.3
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: 1:1 (default for vrf green)
 *>i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                      172.16.255.4             0    100      0 ?
 * i                   172.16.255.4             0    100      0 ?
 *>i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
                      172.16.255.6             0    100      0 ?
 * i                   172.16.255.6             0    100      0 ?
 *>   [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                      ::                                    32768 ?
 *>   [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                      ::                                    32768 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                      ::                                    32768 ?
Leaf-01#
```

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

```
Leaf-01# 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,
```

```
       e - encap-helper tunnel flag
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), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(172.16.254.4, 239.1.1.1), 00:01:54/00:01:05, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:01:54/00:01:05

(172.16.254.6, 239.1.1.1), 00:01:56/00:01:03, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:01:56/00:01:03

(*, 224.0.1.40), 1d01h/00:02:53, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d01h/00:02:53

(*, 225.0.0.102), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(172.16.254.4, 225.0.0.102), 1d01h/00:02:01, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:10

(172.16.254.6, 225.0.0.102), 1d01h/00:02:20, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(*, 225.0.0.101), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(172.16.254.3, 225.0.0.101), 1d01h/00:01:58, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:08
Leaf-01#
```

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

```
Leaf-01# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/114/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 13/0/127/0, Other: 2/2/0
   HW Forwarding:   7870/0/164/0, Other: 0/0/0
   Null0 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/172/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   5222/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   2137/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   11/0/168/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 4/0/150/0, Other: 0/0/0
   HW Forwarding:   518/0/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
```

```
   HW Forwarding:   498/1/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
Leaf-01#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 186

Outputs to Verify the Configuration on VTEP 2

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

```
Leaf-02# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 1d01h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 1d01h
nve1       50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 1d01h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 1d01h
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  1d01h
nve1       10102    L2CP 172.16.254.6     5              10102      UP   N/A  1d01h
Leaf-02#
```

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

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
--------- -------- ----------------------  ---------- -------- --------
nve1      10101    172.16.254.3            6          10101    1d01h
nve1      10102    172.16.254.6            5          10102    1d01h
Leaf-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on VTEP 2:

```
Leaf-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 63, main routing table version 63
6 network entries using 2352 bytes of memory
8 path entries using 1280 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7436 total bytes of memory
BGP activity 128/33 prefixes, 221/93 paths, scan interval 60 secs
6 networks peaked at 15:50:41 Aug 6 2020 UTC (21:30:56.871 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1797    1698       63    0    0 1d01h           2
172.16.255.2    4        65001    1792    1701       63    0    0 1d01h           2
Leaf-02#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **group-map** command on VTEP 2:

```
Leaf-02# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Vl901,::FFFF:172.16.254.6
    Info source: Static
    Uptime: 1d01h, Groups: 1
Leaf-02#
```

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

```
Leaf-02# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 2, type internal
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.6%default, Vlan901%default
      From AC10:FF01::
      opaque_ptr 0x7F65BA333AD0
      Last updated 1d01h ago
Leaf-02#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on VTEP 2:

```
Leaf-02# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan102
   1d00h     00:02:25
Leaf-02#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on VTEP 2:

```
Leaf-02# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d00h/never, RP FC00:2:255::255, flags: SCJg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan102, Forward, 1d00h/never

(FC00:1:102::12, FF06:1::1), 00:05:45/00:01:27, flags: SFJTGq
  Incoming interface: Vlan102
  RPF nbr: FE80::46D3:CAFF:FE28:6CC5
```

```
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:05:45/never

(FC00:2:255::1, FF06:1::1), 00:05:04/00:02:07, flags: SJTgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Inherited Outgoing interface list:
    Vlan102, Forward, 1d00h/never
Leaf-02#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on VTEP 2:

```
Leaf-02# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF00::/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF00::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF02::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 9/9/0
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   3/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A NS
   Vlan102 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:102::12,FF06:1::1) Flags: HW
   SW Forwarding: 3/0/100/0, Other: 2/2/0
   HW Forwarding:   168/0/118/0, Other: 0/0/0
   Vlan102 Flags: A F
     Pkts: 0/0/0    Rate: 0 pps
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/2    Rate: 0 pps
 (FC00:2:255::1,FF06:1::1) Flags: HW
   SW Forwarding: 1/0/100/0, Other: 0/0/0
   HW Forwarding:   148/0/126/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan102 Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,FF10::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF12::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
 (*,FF70::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF72::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF80::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF82::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF90::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF92::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFA0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFA2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFB0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFB2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFC0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFC2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFD0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFD2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFE0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFE2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFF0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFF2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on VTEP 2:

```
Leaf-02# show bgp ipv6 mvpn all
BGP table version is 63, local router ID is 172.16.255.4
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: 1:1 (default for vrf green)
 *>   [5][1:1][FC00:1:102::12][FF06:1::1]/42
                       ::                                   32768 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
```

```
                     172.16.255.6             0    100      0 ?
 *>i                  172.16.255.6             0    100      0 ?
 *>   [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                     ::                                    32768 ?
 *>i  [7][1:1][65001][FC00:1:102::12][FF06:1::1]/46
                     172.16.255.3             0    100      0 ?
 *>   [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                     ::                                    32768 ?
Route Distinguisher: 172.16.254.4:102
 * i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                     172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Leaf-02#
```

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

```
Leaf-02# 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,
       e - encap-helper tunnel flag
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), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.4, 239.1.1.1), 00:05:43/00:01:46, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:05:43/00:02:43

(172.16.254.6, 239.1.1.1), 00:05:45/00:01:06, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:05:45/00:00:14

(*, 224.0.1.40), 1d01h/00:02:31, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d01h/00:02:31

(*, 225.0.0.102), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.6, 225.0.0.102), 1d01h/00:00:55, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
```

```
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.4, 225.0.0.102), 1d01h/00:01:49, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:26

(*, 225.0.0.101), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.3, 225.0.0.101), 1d01h/00:01:46, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32
Leaf-02#
```

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

```
Leaf-02# 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,
                e   - Encap helper tunnel flag.
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
   GigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2/0/170/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 1/0/150/0, Other: 0/0/0
   HW Forwarding:   7870/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
    HW Forwarding:   1/0/224/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,225.0.0.102) Flags: HW
    SW Forwarding: 2/0/163/0, Other: 3/1/2
    HW Forwarding:   5353/0/164/0, Other: 0/0/0
    Null0 Flags: A
    GigabitEthernet1/0/2 Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,225.0.0.102) Flags: HW
    SW Forwarding: 1/0/206/0, Other: 0/0/0
    HW Forwarding:   2165/0/163/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
  (*,232.0.0.0/8) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
  (*,239.1.1.1) Flags: C HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   5/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/0    Rate: 0 pps
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 1/0/150/0, Other: 1495/1491/4
    HW Forwarding:   742/0/156/0, Other: 0/0/0
    Null0 Flags: A NS
    GigabitEthernet1/0/2 Flags: F
      Pkts: 0/0/1    Rate: 0 pps
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 1/0/150/0, Other: 0/0/0
    HW Forwarding:   1460/1/168/1, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A NS
    Tunnel0, VXLAN Decap Flags: F NS
      Pkts: 0/0/1    Rate: 0 pps
Leaf-02#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 186

Outputs to Verify the Configuration on Border VTEP

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

```
Border# show nve peers
Interface  VNI      Type Peer-IP          RMAC/Num_RTs   eVNI     state flags UP time
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/-/4 1d01h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 1d01h
nve1       50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901      UP  A/M/6 1d01h
nve1       50901    L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 1d01h
nve1       10101    L2CP 172.16.254.3     6              10101      UP   N/A  1d01h
nve1       10102    L2CP 172.16.254.4     7              10102      UP   N/A  1d00h
Border#
```

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

```
Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP                 Num routes eVNI     UP time
```

```
--------- -------- ------------------------  ---------- -------- --------
nve1      10101    172.16.254.3              6          10101    1d01h
nve1      10102    172.16.254.4              7          10102    1d00h
Border#
```

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Border VTEP:

```
Border# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 62, main routing table version 62
5 network entries using 1960 bytes of memory
8 path entries using 1280 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
19 BGP extended community entries using 2682 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7354 total bytes of memory
BGP activity 122/28 prefixes, 244/122 paths, scan interval 60 secs
5 networks peaked at 15:42:39 Aug 6 2020 UTC (21:35:36.535 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1    4        65001    1810    1710       62    0    0 1d01h           3
172.16.255.2    4        65001    1810    1704       62    0    0 1d01h           3
Border#
```

The following example shows the output for the **show ip pim vrf** *vrf-name* **group-map** command on Border VTEP:

```
Border# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Vl2001,FE80::A2B4:39FF:FE21:9183
    Info source: Static
    Uptime: 1d01h, Groups: 1
Border#
```

The following example shows the output for the **show ip routing vrf** *vrf-name* command on Border VTEP:

```
Border# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "ospf 1", distance 110, metric 2, type intra area
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    FE80::A2B4:39FF:FE21:9183, Vlan2001
      From FE80::A2B4:39FF:FE21:9183
      Last updated 1d01h ago
Border#
```

The following example shows the output for the **show ipv6 mld vrf** *vrf-name* **groups** command on Border VTEP:

```
Border# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                           Interface
    Uptime    Expires
FF06:1::1                               Vlan102
   1d00h     00:04:02
Border#
```

The following example shows the output for the **show ipv6 mroute vrf** *vrf-name* command on Border VTEP:

```
Border# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d00h/never, RP FC00:2:255::255, flags: SCG
  Incoming interface: Vlan2001
  RPF nbr: FE80::A2B4:39FF:FE21:9183
  Immediate Outgoing interface list:
    Vlan102, Null, 1d00h/never
    Vlan901, Forward, 1d00h/never

(FC00:1:102::12, FF06:1::1), 00:10:24/now, flags: STg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan2001, Forward, 00:10:24/00:03:05
  Inherited Outgoing interface list:
    Vlan102, Null, 1d00h/never

(FC00:2:255::1, FF06:1::1), 00:09:43/never, flags: STGq
  Incoming interface: Vlan2001
  RPF nbr: FE80::A2B4:39FF:FE21:9183
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:09:43/never
  Inherited Outgoing interface list:
    Vlan102, Null, 1d00h/never
Border#
```

The following example shows the output for the **show ipv6 mfib vrf** *vrf-name* command on Border VTEP:

```
Border# show ipv6 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,
                e   - Encap helper tunnel flag.
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
 (*,FF00::/8) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF00::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF02::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 9/9/0
 (*,FF06:1::1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 3/3/0
   HW Forwarding:   7/0/122/0, Other: 0/0/0
   Vlan2001 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (FC00:1:102::12,FF06:1::1) Flags: HW
   SW Forwarding: 2/0/100/0, Other: 1/0/1
   HW Forwarding:   311/0/125/0, Other: 0/0/0
   Vlan901, VXLAN Decap Flags: A
   Vlan2001 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
 (FC00:2:255::1,FF06:1::1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   291/0/122/0, Other: 0/0/0
   Vlan2001 Flags: A
   Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
     Pkts: 0/0/0    Rate: 0 pps
 (*,FF10::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF12::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF20::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF22::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF30::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF32::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FF33::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF34::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF35::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF36::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FF37::/32) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
```

```
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:   0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
 (*,FFC0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFC2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFD0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFD2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFE0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFE2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
 (*,FFF0::/15) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,FFF2::/16) Flags:
   SW Forwarding: 0/0/0/0, Other: 0/0/0
Border#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Border VTEP:

```
Border# show bgp ipv4 mvpn all
BGP table version is 62, local router ID is 172.16.255.6
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: 1:1 (default for vrf green)
 *>i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                      172.16.255.4             0    100      0 ?
 * i                    172.16.255.4             0    100      0 ?
 *>   [5][1:1][FC00:2:255::1][FF06:1::1]/42
                      ::                                    32768 ?
 * i  [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                      172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
 * i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                      172.16.255.3             0    100      0 ?
 *>i                   172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>   [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                      ::                                    32768 ?
Border#
```

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

```
Border# 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,
       e - encap-helper tunnel flag
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), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.4, 239.1.1.1), 00:10:23/00:02:45, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:10:23/00:01:36

(172.16.254.6, 239.1.1.1), 00:10:25/00:03:25, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:10:25/00:02:56

(*, 224.0.1.40), 1d01h/00:02:45, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d01h/00:02:45

(*, 225.0.0.102), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.4, 225.0.0.102), 1d01h/00:02:35, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.6, 225.0.0.102), 1d01h/00:03:27, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:02:49, A

(*, 225.0.0.101), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.3, 225.0.0.101), 1d01h/00:01:12, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:53
Border#
```

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

```
Border# 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,
                e   - Encap helper tunnel flag.
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
   TenGigabitEthernet1/0/2 Flags: A NS
   Loopback0 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   8/0/146/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 7/0/125/0, Other: 0/0/0
   HW Forwarding:   8010/0/176/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/7    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   1/0/172/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 1/0/154/0, Other: 0/0/0
   HW Forwarding:   5353/0/176/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/1    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 11/0/167/0, Other: 7/6/1
   HW Forwarding:   2207/0/151/0, Other: 0/0/0
   Null0 Flags: A
   TenGigabitEthernet1/0/2 Flags: F
     Pkts: 0/0/10    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   8/0/168/0, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A NS
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
```

```
   SW Forwarding: 4/0/150/0, Other: 0/0/0
   HW Forwarding:   2032/1/168/1, Other: 0/0/0
   TenGigabitEthernet1/0/2 Flags: A
   Tunnel0, VXLAN Decap Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 2/0/150/0, Other: 4/4/0
   HW Forwarding:   2015/1/156/1, Other: 0/0/0
   Null0 Flags: A
   TenGigabitEthernet1/0/2 Flags: F
     Pkts: 0/0/1    Rate: 0 pps
Border#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 186

Outputs to Verify the Configuration on Spine Switch 1

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Spine Switch 1:

```
Spine-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 61, main routing table version 61
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7428 total bytes of memory
BGP activity 257/209 prefixes, 3003/2900 paths, scan interval 60 secs
5 networks peaked at 15:48:28 Aug 6 2020 UTC (21:38:24.468 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    1700    1808       61    0    0 1d01h           3
172.16.255.4    4        65001    1706    1805       61    0    0 1d01h           3
172.16.255.6    4        65001    1713    1813       61    0    0 1d01h           2
Spine-01#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Spine Switch 1:

```
Spine-01# show bgp ipv6 mvpn all
BGP table version is 61, local router ID is 172.16.255.1
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: 1:1
 * i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                      172.16.255.4             0    100      0 ?
 *>i                   172.16.255.4             0    100      0 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
```

```
                     172.16.255.6             0    100      0 ?
 *>i                  172.16.255.6             0    100      0 ?
 *>i  [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 * i                  172.16.255.4             0    100      0 ?
 * i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                     172.16.255.4             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 *>i                  172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                     172.16.255.3             0    100      0 ?
 * i                  172.16.255.3             0    100      0 ?
 * i                  172.16.255.6             0    100      0 ?
Spine-01#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 1:

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-01#
```

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

```
Spine-01# 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), 00:13:12/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 00:11:10/00:01:49, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:13:12/00:02:08, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:04, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
```

```
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:04

(*, 225.0.0.102), 1w0d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 225.0.0.102), 00:19:31/00:02:22, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 1d01h/00:01:52, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
Spine-01#
```

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

```
Spine-01# 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: 82/82/0
   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
   Tunnel1 Flags: A
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 1/0/206/0, Other: 279/0/279
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/2 Flags: NS
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/4 Flags: NS
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
```

```
    SW Forwarding: 0/0/0/0, Other: 1/0/1
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    Tunnel1 Flags: A
  (172.16.254.4,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   1224/0/168/0, Other: 0/0/0
    GigabitEthernet1/0/2 Flags: A
  (172.16.254.6,239.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 0/0/0
    HW Forwarding:   0/0/0/0, Other: 0/0/0
    GigabitEthernet1/0/4 Flags: A NS
Spine-01#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 186

Outputs to Verify the Configuration on Spine Switch 2

The following example shows the output for the **show bgp ipv6 mvpn all summary** command on Spine Switch 2:

```
Spine-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 61, main routing table version 61
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7428 total bytes of memory
BGP activity 288/240 prefixes, 3108/3005 paths, scan interval 60 secs
5 networks peaked at 15:49:16 Aug 6 2020 UTC (21:40:40.843 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.3    4        65001    1700    1810       61    0    0 1d01h           3
172.16.255.4    4        65001    1711    1803       61    0    0 1d01h           3
172.16.255.5    4        65001       0       0        1    0    0 08:41:01 Idle
172.16.255.6    4        65001    1710    1815       61    0    0 1d01h           2
172.16.255.7    4        65001       0       0        1    0    0 08:40:29 Idle
Spine-02#
```

The following example shows the output for the **show bgp ipv6 mvpn all** command on Spine Switch 2:

```
Spine-02# show bgp ipv6 mvpn all
BGP table version is 61, local router ID is 172.16.255.2
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: 1:1
 * i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
                      172.16.255.4             0    100      0 ?
```

```
 *>i                    172.16.255.4             0    100      0 ?
 * i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
                        172.16.255.6             0    100      0 ?
 *>i                    172.16.255.6             0    100      0 ?
 *>i  [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
                        172.16.255.3             0    100      0 ?
 * i                    172.16.255.3             0    100      0 ?
 * i                    172.16.255.4             0    100      0 ?
 * i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
                        172.16.255.4             0    100      0 ?
 * i                    172.16.255.3             0    100      0 ?
 *>i                    172.16.255.3             0    100      0 ?
Route Distinguisher: 172.16.254.4:102
 *>i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
                        172.16.255.3             0    100      0 ?
 * i                    172.16.255.3             0    100      0 ?
 * i                    172.16.255.6             0    100      0 ?
Spine-02#
```

The following example shows the output for the **show ip pim rp mapping** command on Spine Switch 2:

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
    RP: 172.16.255.255 (?)
Spine-02#
```

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

```
Spine-02# 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), 3d08h/00:03:24, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:24
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:06
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:02

(172.16.254.4, 239.1.1.1), 00:15:27/00:02:45, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 00:15:27/00:03:02
```

```
    GigabitEthernet1/0/1, Forward/Sparse, 00:15:27/00:03:06

(172.16.254.6, 239.1.1.1), 00:15:29/00:02:38, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:15:29/00:03:06
    GigabitEthernet1/0/2, Forward/Sparse, 00:15:29/00:03:24

(*, 224.0.1.40), 1w0d/00:03:27, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:02:31
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:27
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:08
    Loopback2, Forward/Sparse, 1w0d/00:02:17

(*, 225.0.0.102), 1w0d/00:03:21, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:02
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:02:50
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:21

(172.16.254.4, 225.0.0.102), 1d01h/00:01:55, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:21
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:02

(172.16.254.6, 225.0.0.102), 1d01h/00:02:03, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:02
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:13

(*, 225.0.0.101), 3d08h/00:03:29, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:05
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:07
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:29

(172.16.254.3, 225.0.0.101), 1d01h/00:02:39, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:05
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:29
Spine-02#
```

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

```
Spine-02# 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
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   Loopback2 Flags: F IC NS
     Pkts: 0/0/0    Rate: 0 pps
 (*,225.0.0.101) Flags: C HW
   SW Forwarding: 9/0/112/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/2    Rate: 0 pps
 (172.16.254.3,225.0.0.101) Flags: HW
   SW Forwarding: 4/0/132/0, Other: 0/0/0
   HW Forwarding:   8067/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/1 Flags: A
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/4    Rate: 0 pps
 (*,225.0.0.102) Flags: C HW
   SW Forwarding: 27/0/101/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.4,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   5404/0/176/0, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.6,225.0.0.102) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2214/0/163/0, Other: 0/0/0
   GigabitEthernet1/0/4 Flags: A NS
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
```

```
    Pkts: 0/0/0    Rate: 0 pps
 (*,232.0.0.0/8) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
 (*,239.1.1.1) Flags: C HW
   SW Forwarding: 9/0/150/0, Other: 0/0/0
   HW Forwarding:   0/0/0/0, Other: 0/0/0
   Tunnel1 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/3    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/3    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/3    Rate: 0 pps
 (172.16.254.4,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2629/1/168/1, Other: 0/0/0
   GigabitEthernet1/0/2 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/4 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
 (172.16.254.6,239.1.1.1) Flags: HW
   SW Forwarding: 0/0/0/0, Other: 0/0/0
   HW Forwarding:   2607/1/168/1, Other: 0/0/0
   GigabitEthernet1/0/4 Flags: A
   GigabitEthernet1/0/1 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
   GigabitEthernet1/0/2 Flags: F NS
     Pkts: 0/0/0    Rate: 0 pps
Spine-02#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 186

Outputs to Verify the Configuration on Router 3 (RP Outside the BGP EVPN VXLAN Fabric)

The following example shows the output for the **show ip pim group-map** command on Router 3:

```
R3# show ipv6 pim group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
    SM, RP: FC00:2:255::255
    RPF: Tu4,FC00:2:255::255 (us)
    Info source: Static
    Uptime: 1d04h, Groups: 1
R3#
```

The following example shows the output for the **show ipv6 mroute** command on Router 3:

```
R3# show ipv6 mroute
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
```

```
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d04h/00:03:12, RP FC00:2:255::255, flags: S
  Incoming interface: Tunnel4
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    TenGigabitEthernet0/0/1, Forward, 1d04h/00:03:12
    TenGigabitEthernet0/0/0, Forward, 1d01h/00:02:45

(FC00:1:102::12, FF06:1::1), 00:18:43/00:03:12, RP FC00:2:255::255, flags: SPR
  Incoming interface: Tunnel4
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    TenGigabitEthernet0/0/0, Null, 00:18:43/00:02:45
    TenGigabitEthernet0/0/1, Null, 00:18:43/00:03:12

(FC00:1:102::12, FF06:1::1), 00:18:45/00:03:12, flags: S
  Incoming interface: TenGigabitEthernet0/0/0
  RPF nbr: FE80::A2B4:39FF:FE21:9181
  Inherited Outgoing interface list:
    TenGigabitEthernet0/0/1, Forward, 1d04h/00:03:12

(FC00:2:255::1, FF06:1::1), 00:18:08/00:02:55, RP FC00:2:255::255, flags: SPR
  Incoming interface: Tunnel4
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    TenGigabitEthernet0/0/0, Null, 00:18:08/00:02:45
    TenGigabitEthernet0/0/1, Null, 00:18:04/00:03:12

(FC00:2:255::1, FF06:1::1), 00:18:06/00:02:55, flags: S
  Incoming interface: TenGigabitEthernet0/0/0
  RPF nbr: FE80::A2B4:39FF:FE21:9181
  Inherited Outgoing interface list:
    TenGigabitEthernet0/0/1, Forward, 1d04h/00:03:12
R3#
```

Return to Verifying TRM with PIM-SM for IPv4 and IPv6 Multicast Traffic when the RP is Outside the BGP EVPN VXLAN Fabric, on page 186

Troubleshooting Tenant Routed Multicast

See Troubleshoot EVPN VxLAN TRM on Catalyst 9000 Switches document to learn how to troubleshoot issues with TRM in a BGP EVPN VXLAN fabric.