



# Configuring Optimized Layer 2 Overlay Multicast

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## Restrictions for Optimized Layer 2 Overlay Multicast

- This feature does not support data multicast distribution tree (MDT) in the underlay.
- Optimized Layer 2 overlay source specific multicast forwarding (S,G) is not supported. Only (\*,G) is supported.
- Optimized Layer 2 overlay multicast is ineffective for a Distributed Anycast Gateway deployment (use Layer 3 tenant routed multicast in a Distributed Anycast Gateway deployment). Optimized Layer 2 overlay multicast is applicable between Layer 2 leaf or the centralized gateway that extends the bridge-domain over the EVPN VXLAN fabric.
- Optimized Layer 2 overlay multicast handoff to Layer 3 tenant routed multicast (TRM) within the EVPN fabric is not supported.

## Information About Optimized Layer 2 Overlay Multicast

Optimized Layer 2 Overlay Multicast functionality is based on Internet Group Management Protocol (IGMP) or Multicast Listener Discovery (MLD) Proxy for EVPN, as defined in [draft-ietf-bess-evpn-igmp-ml-d-proxy](#).

In a BGP EVPN VXLAN fabric, there can be many hosts attached to a VLAN that is stretched across several sites. These hosts send IGMP membership reports to join their interested multicast groups. Also, the IGMP router periodically sends membership queries to find out if there are hosts on a VLAN that are interested in receiving multicast traffic for that group. This leads to a flooding of IGMP reports and queries in the overlay network across multiple sites. The network may have few hosts, but the IGMP messages are sent to all VTEPs, resulting in an overloading of the fabric. This necessitates an IGMP or MLD Proxy to efficiently forward the multicast traffic. When you enable an IGMP or MLD Proxy on the VTEP, the proxy forwards the multicast traffic only to the interested receivers, thus optimizing the bandwidth of the fabric.

Optimized Layer 2 Overlay Multicast functionality facilitates multicast traffic both at the access level and within the VXLAN fabric. Optimized Layer 2 Overlay Multicast is restricted to a Layer 2 Virtual Network Instance (L2VNI), wherein the source and receivers are within the same Layer 2 domain. Layer 2 multicast data traffic is not forwarded to a VTEP or a port that does not have a multicast router or receiver attached to it.

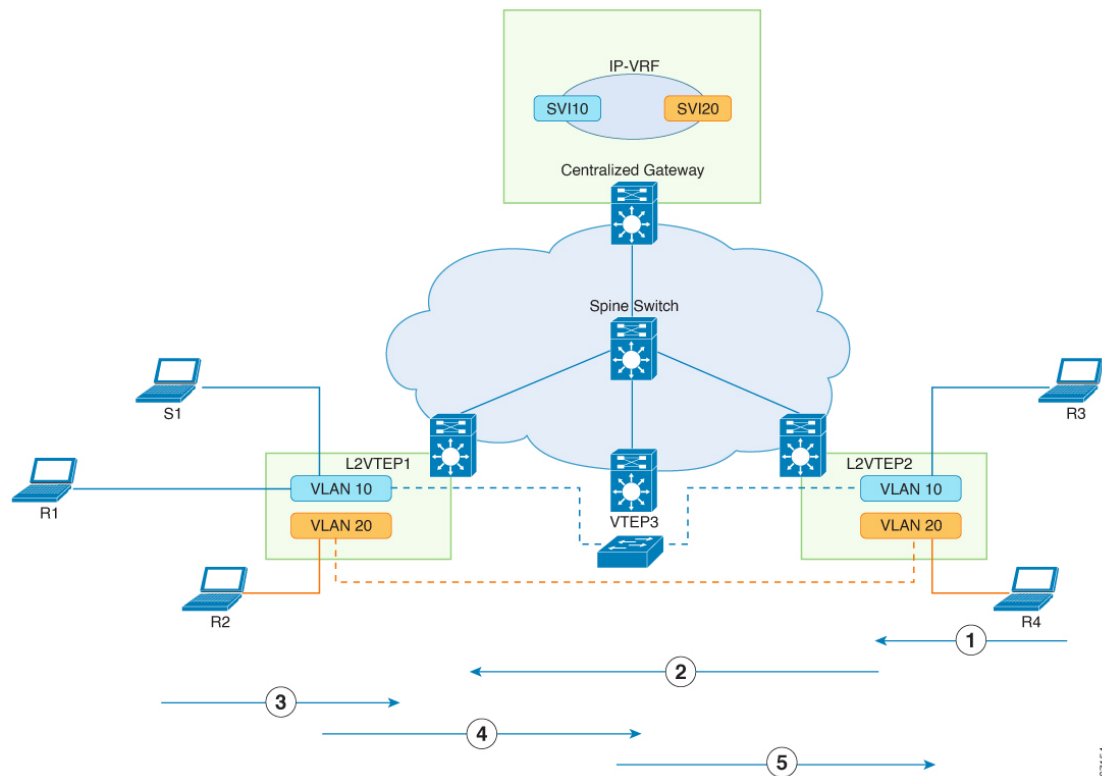
Optimized Layer 2 Overlay Multicast supports both IPv4 and IPv6 multicast traffic in a Layer 2 EVPN VXLAN fabric.

## Optimized Layer 2 Multicast in BGP EVPN VXLAN Layer 2 Overlay

Optimized Layer 2 Overlay Multicast uses an EVPN instance to build an IGMP or MLD overlay. When a VTEP receives an IGMP or MLD report from a host on the access link, it propagates this information to all other VTEPs in the same EVPN instance, using EVPN Route Type 6 (RT6). Propagation of RT6 updates the multicast forwarding tree for the intra-VLAN multicast traffic in the fabric. If a host on a second VTEP sends multicast traffic to a group that already has receivers, traffic is forwarded in the established multicast forwarding tree. Multicast traffic source and receiver, which are on the same VLAN, but stretched across VTEPs in the BGP EVPN VXLAN fabric, can communicate with each other.

### Source and Receiver on Same VLAN, Connected to Different Layer 2 VTEPs

Figure 1: Topology Showing Layer 2 Overlay Multicast Traffic Within a VLAN



1. Receiver R3 in VLAN 10 sends (\*,G) IGMP Join to VTEP 2. (\*,G) is created at VTEP 2.
2. VTEP 2 sends EVPN route type 6 to VTEP 1. (\*,G) is created at VTEP 1.

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3. Source S1 in VLAN 10 starts streaming data. VTEP 1 forwards the multicast packets to all other VTEPs that have receivers.
4. Layer 2 multicast packets are encapsulated with L2VNI that corresponds to VLAN 10 and are forwarded through the overlay to VTEP 2.
5. On VTEP 2, the L2VNI encapsulated data packets are decapsulated and forwarded to the port where receiver R3 is connected.

## Optimized Layer 2 Overlay Multicast Interworking in BGP EVPN VXLAN Fabric

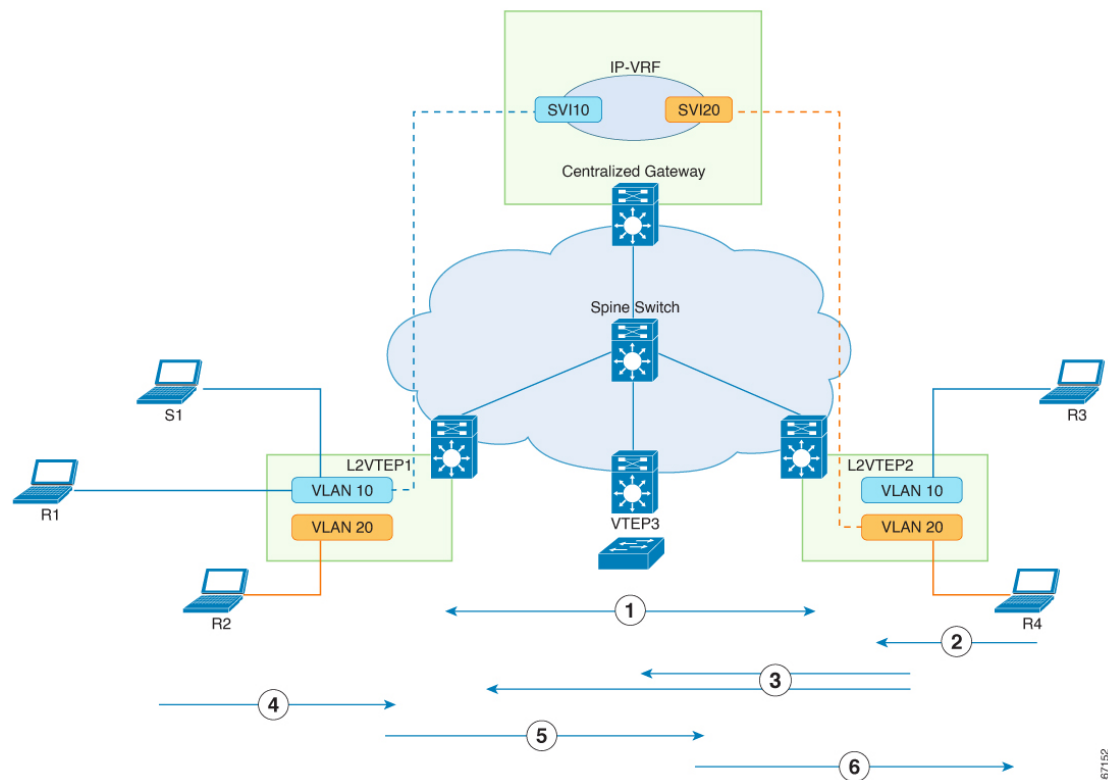
VTEPs in the EVPN VXLAN network forward traffic to each other through the VXLAN gateways. An EVPN VXLAN Centralized Gateway (CGW) VTEP performs the Layer 3 gateway function for all the Layer 2 virtual network instances (VNIs). All the other VTEPs in the network perform only bridging. For information on CGW, see [Configuring EVPN VXLAN Integrated Routing and Bridging](#).

### Optimized Layer 2 Multicast Across Layer 2 Overlays

In an EVPN VXLAN fabric, a CGW performs routing for the inter-L2VNI Layer 2 multicast traffic. In this case, the sender and receiver, can both be on the same VTEP or on different VTEPs within the EVPN VXLAN fabric.

#### Source and Receiver on Different VLANs, Connected to Different Layer 2 VTEPs

*Figure 2: Topology Showing Layer 2 Overlay Multicast Traffic Between Different VLANs*



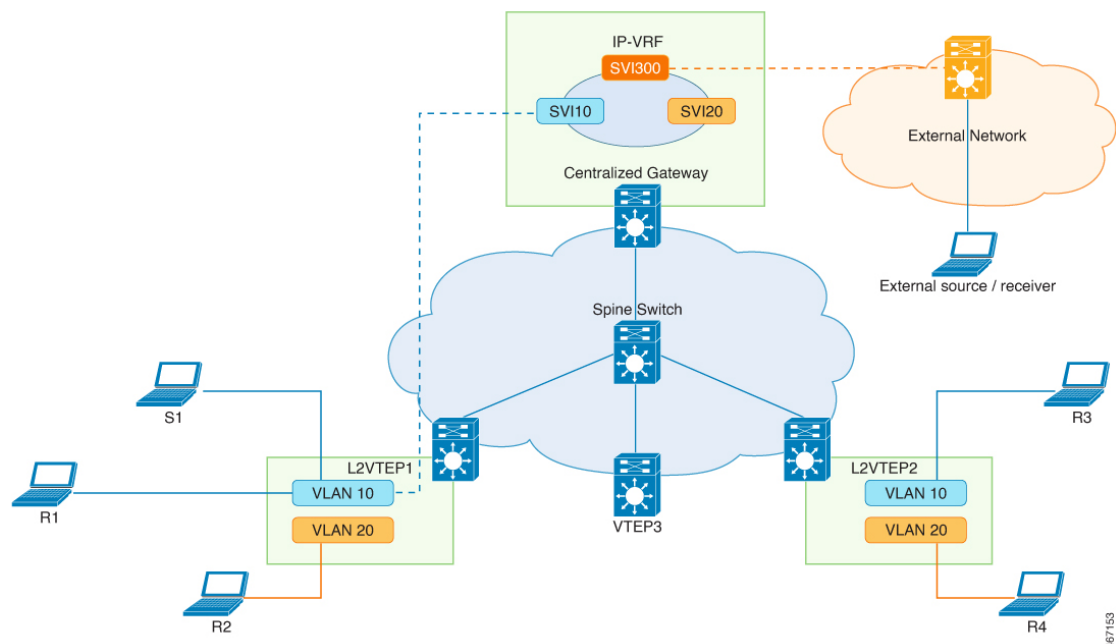
1. CGW sends EVPN route type 6 (\*, \*) to all the Layer 2 VTEPs in EVPN VXLAN fabric.
2. Receiver R4 in VLAN 20 sends (\*, G) IGMP join to VTEP 2. (\*, G) is created in IGMP snooping table on VTEP 2.
3. VTEP 2 sends EVPN route type 6 (\*, G) to the CGW and all other Layer 2 VTEPs. (\*, G) is also created in Layer 3 multicast on the CGW.
4. Source S1 in VLAN 10 starts streaming data. VTEP1 forwards the multicast traffic.
5. Layer 2 multicast traffic is switched through L2VNI to the CGW, based on the default EVPN route type 6.

In the CGW, multicast data packets are processed by Layer 3 Multicast and routed to access SVI20, where the receiver R4 is connected.

6. Multicast traffic is forwarded to VTEP 2 through L2VNI. On egress VTEP 2, Layer 2 Overlay Multicast switches the data packets to the port where the receiver R4 is connected.

## Optimized Layer 2 Overlay Multicast Handoff with External Network

Figure 3: Topology Showing Layer 2 Overlay Multicast Traffic Handoff to an External Network



In this topology, either the multicast receiver or sender exists on an external network. The Centralized Gateway is configured to route the multicast traffic between the EVPN VXLAN fabric and the external network. The leaf VTEPs in the VXLAN fabric perform only bridging.

If a source device that is connected to a Layer 2 VTEP starts streaming multicast traffic, the traffic is bridged from the Layer 2 VTEP to the Centralized Gateway VTEP. The Centralized Gateway VTEP then routes the multicast traffic to the interested receivers in the external network.

The rendezvous point (RP) is located outside the fabric.

## Replication Types Supported in an Underlay Network

Optimized Layer 2 Overlay Multicast (OL2OM) supports the following replication types:

- Ingress Replication
- Underlay Multicast with Default MDT

### Ingress Replication

Ingress replication, or headend replication, is a unicast approach to handle multdestination Layer 2 overlay broadcast, unknown unicast, and multicast (BUM) traffic. For more information, see [Ingress Replication](#). OL2OM uses the ingress replication mechanism to send the Layer 2 overlay multicast traffic only to those VTEPs where receivers have joined the multicast group. If ingress replication is already configured as part of the initial Layer 2 VNI configuration, OL2OM uses the same mode of replication, without the need for extra configuration steps. Using ingress replication to handle OL2OM traffic can result in scaling issues because an ingress device must replicate the multicast traffic as many times as the number of VTEPs that are associated with the Layer 2 VNI. Use ingress replication in a network that has fewer receivers.

### Underlay Multicast with Default MDT

A multicast distribution tree (MDT) is a multicast tunnel that transports multicast traffic. Traffic through the default MDT is flooded to all remote VTEPs, irrespective of whether the VTEP has any receivers or not. For more information, see [Underlay Multicast](#). For a large-scale fabric network, we recommend Underlay Multicast Replication. Optimized Layer 2 Overlay Multicast traffic can take advantage of the underlying multicast network for data replication to support better scale and performance.

## How to Configure Optimized Layer 2 Overlay Multicast

Configure Optimized Layer 2 Overlay Multicast in the fabric and also on the host-facing or Layer 2 access devices.

### Prerequisites for Configuring Optimized Layer 2 Overlay Multicast

Before configuring Optimized Layer 2 Overlay Multicast, ensure that the EVPN VXLAN Layer 2 Overlay network has been configured by performing all the procedures that are listed in [How to Configure EVPN VXLAN Layer 2 Overlay Network](#).

## Configure Optimized Layer 2 Multicast in EVPN VXLAN Layer 2 Overlay

The following sections provide information about how to configure optimized Layer 2 multicast in an EVPN VXLAN Layer 2 overlay.

### Enable Optimized Layer 2 Overlay Multicast in BGP EVPN VXLAN Fabric

Follow these steps to enable Optimized Layer 2 Overlay Multicast in the EVPN VXLAN fabric.

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> <b>enable</b>	Enables privileged EXEC mode. Enter your password, if prompted.
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>l2vpn evpn</b> <b>Example:</b> Device(config)# <b>l2vpn evpn</b>	Enters EVPN configuration mode.
<b>Step 4</b>	<b>multicast advertise</b> <b>Example:</b> Device(config-evpn)# <b>multicast advertise</b>	Enables Optimized Layer 2 multicast for all EVPN instances on the device.  Optionally, you can enable or disable Optimized Layer 2 Multicast for an EVPN instance using the <b>multicast advertise { enable   disable }</b> command in the evpn-evi configuration mode.  Example: Device(config-evpn-evi)# <b>multicast advertise disable</b>
<b>Step 5</b>	<b>end</b> <b>Example:</b> Device(config-evpn)# <b>end</b>	Returns to privileged EXEC mode.

**Configure Optimized Layer 2 Overlay Multicast for IPv4**

In addition to the steps provided in [Prerequisites for Configuring Optimized Layer 2 Overlay Multicast, on page 5](#), perform the following steps to configure Optimized Layer 2 Overlay Multicast on the access devices that have IPv4 endpoints.

**Procedure**

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

	Command or Action	Purpose
<b>Step 3</b>	<b>ip igmp snooping querier</b> <b>Example:</b> Device(config)# ip igmp snooping querier	Enables the IGMP snooping querier.
<b>Step 4</b>	<b>ip igmp snooping querier version <i>version-num</i></b> <b>Example:</b> Device(config)# ip igmp snooping querier version 3	Configures the IGMP version that the querier feature uses. By default, IGMP Version 2 is configured.  IGMP Version 2 extends the IGMP functionality with features such as the IGMP leave process, group-specific queries, and an explicit maximum query response time.  IGMP Version 3 provides the functionality for Basic IGMPv3 Snooping Support (BISS), which includes support for the snooping features and for IGMPv3 membership report messages.
<b>Step 5</b>	<b>ip igmp snooping querier [max-response-time <i>seconds</i>] [timer expiry <i>seconds</i>]</b> <b>Example:</b> Device(config)# ip igmp snooping querier max-response-time 25 Device(config)# ip igmp snooping querier timer expiry 200	(Optional) Configures the IGMP snooping querier parameters.  <b>max-response-time</b> configures a maximum response time for snooping query messages. The range is from 1 to 25 seconds.  <b>timer expiry</b> sets the length of time until the IGMP querier expires. The range is from 60 to 300 seconds.
<b>Step 6</b>	<b>end</b> <b>Example:</b> Device(config-evpn)# end	Returns to privileged EXEC mode.

## Configure Optimized Layer 2 Overlay Multicast for IPv6

In addition to the information provided in the [Prerequisites for Configuring Optimized Layer 2 Overlay Multicast, on page 5](#), perform the following steps to configure Optimized Layer 2 Overlay Multicast on the access devices that support IPv6 endpoints.

### Procedure

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

	Command or Action	Purpose
<b>Step 3</b>	<b>ipv6 mld snooping</b> <b>Example:</b> Device(config)# <code>ipv6 mld snooping</code>	Enables the MLD snooping.
<b>Step 4</b>	<b>ipv6 mld snooping querier</b> <b>Example:</b> Device(config)# <code>ipv6 mld snooping querier</code>	Enables the MLD snooping querier.
<b>Step 5</b>	<b>end</b> <b>Example:</b> Device(config)# <code>end</code>	Returns to privileged EXEC mode.

## Configure Optimized Layer 2 Overlay Multicast Interworking

Optimized Layer 2 Overlay Multicast Interworking supports the following scenarios:

- Optimized Layer 2 Multicast across Layer 2 Overlays within the same fabric domain
- Optimized Layer 2 Overlay Multicast handoff with IP Multicast external network

### Before You Begin

Perform the steps in the sequence listed here:

1. Before you configure the interworking scenarios, ensure that you set up the centralized gateway by performing all the steps described in [Configuring EVPN VXLAN Integrated Routing and Bridging using Centralized Default Gateway](#).
2. Enable Optimized Layer 2 Multicast on the centralized gateway by performing all the configurations described earlier in this document, under [Configure Optimized Layer 2 Multicast in EVPN VXLAN Layer 2 Overlay](#).

## Enable Layer 3 Multicast on Centralized Gateway

Follow these steps to enable Layer 3 Multicast on the Centralized Gateway.

### Procedure

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



	Command or Action	Purpose
<b>Step 3</b>	<b>{ ip   ipv6 } multicast-routing</b> <b>Example:</b> Device(config)# <b>ip multicast-routing</b>	Enables IP multicast routing. <b>Note</b> If the Centralized Gateway is associated with a VRF, run the <b>ip multicast-routing vrf vrf-name</b> command.
<b>Step 4</b>	<b>interface vlan vlan-id</b> <b>Example:</b> Device(config)# <b>interface vlan 20</b>	Specifies the interface on which you want to enable IP multicast and enters the interface configuration mode.
<b>Step 5</b>	<b>ip pim sparse-mode</b> <b>Example:</b> Device(config-if)# <b>ip pim sparse-mode</b>	Enables IP multicast on the interface.
<b>Step 6</b>	<b>ip igmp version version</b> <b>Example:</b> Device(config-if)# <b>ip igmp version 3</b>	Enables IGMP version on this interface. The default version of IGMP is set to Version 2. Repeat Step 4 to Step 6 for all the L2VNIs that have a source or receiver.
<b>Step 7</b>	<b>exit</b> <b>Example:</b> Device(config-if)# <b>exit</b>	Returns to global configuration mode.
<b>Step 8</b>	<b>{ ip   ipv6 } pim [ vrf vrf-name ] rp-address rp-address</b> <b>Example:</b> Device(config)# <b>ip pim rp-address 99.99.99.99</b>	Configures the Layer 3 Multicast rendezvous point (RP).

## Verifying Optimized Layer 2 Overlay Multicast on VTEP and Centralized Gateway

Use the following **show** commands to verify the configuration of Optimized Layer 2 Overlay Multicast on VTEP and Centralized Gateway.

Command	Purpose
<b>show ip igmp snooping</b>	Verify that EVPN IGMP proxy is enabled in IGMP snooping.
<b>show ip igmp snooping querier</b>	Verify that the IGMP snooping querier version is as expected.
<b>show ip igmp snooping groups</b>	Verify the local and remote multicast group membership in IGMP snooping.

Command	Purpose
<code>show ip mroute vrf &lt;vrf&gt;</code>	Verify the MVPN routing and forwarding instance for the specified VRF.
<code>show ip igmp vrf &lt;vrf-name&gt; groups detail</code>	Verify the multicast groups with receivers that were learned through IGMP, on the centralized gateway.
<code>show ipv6 mld snooping querier</code>	Verify that the MLD snooping querier version is as expected.
<code>show ipv6 mld snooping membership</code>	Verify the local and remote multicast group membership in MLD Snooping.
<code>show ipv6 mroute vrf &lt;vrf-name&gt; &lt;multicast-group-address&gt;</code>	Verify the forwarding status of each IPv6 multicast route.
<code>show ipv6 mld vrf &lt;vrf-name&gt; groups detail</code>	Verify the multicast groups with receivers that were learned through MLD, on the centralized gateway.
<code>show l2vpn evpn default-gateway</code>	Verify the entries of the default gateway database.
<code>show l2vpn evpn multicast [local] [remote]</code>	Verify the local and remote multicast group membership in EVPN Manager.
<code>show l2vpn evpn evi &lt;evpn-instance&gt; detail</code>	Verify the Layer 2 multicast status for the specified EVPN instance.
<code>show l2route evpn multicast smet [local] [remote] [local combined]</code>	Verify the Selective Multicast Ethernet Tag Route (SMET) routes that the Layer 2 Route Information Base (L2RIB) receives from EVPN.
<code>show l2route evpn multicast routes group &lt;multicast-address&gt;</code>	Verify the multicast routes that are sent to L2FIB.
<code>show bgp l2vpn evpn route-type 6</code>	Verify the local and remote SMET routes in BGP.
<code>show bgp l2vpn evpn summary</code>	Verify the BGP EVPN routes on the spine switch.
<code>show ip pim neighbor</code>	Verify the Protocol Independent Multicast (PIM) neighbors that are discovered by the device.
<code>show ip pim rp mapping</code>	Verify that the PIM group-to-rendezvous point (RP) mappings are populated correctly on the device.
<code>show ip msdp peer</code>	Verify the Multicast Source Discovery Protocol (MSDP) peer information on the spine switch.

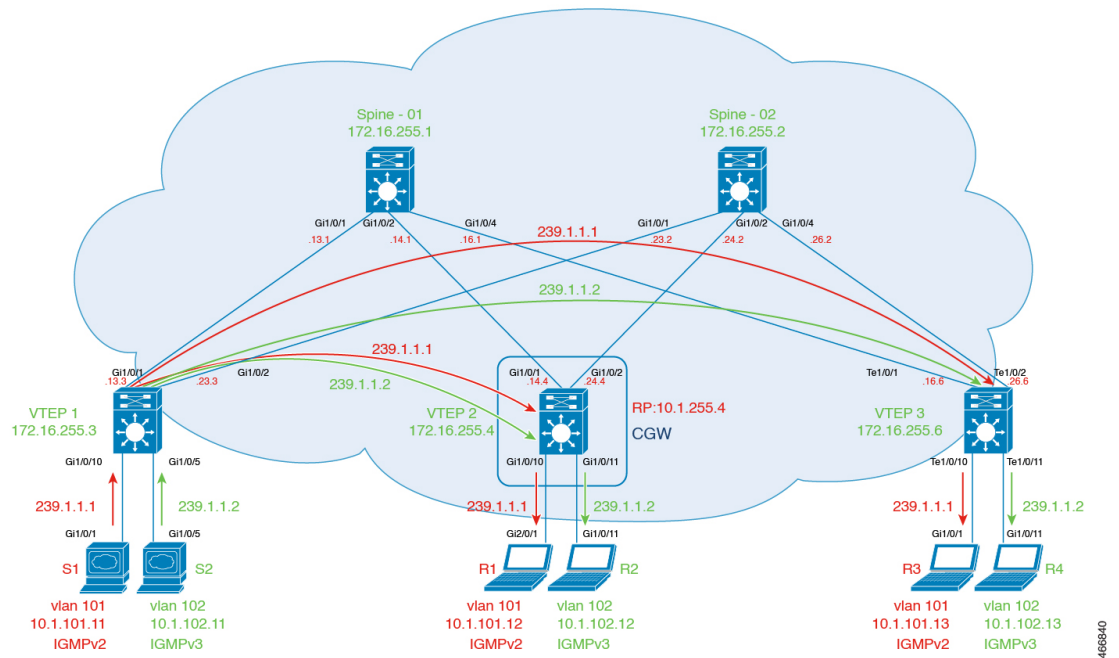
## Configuration Examples for Optimized Layer 2 Overlay Multicast

The following sections provide examples to show how to configure Optimized Layer 2 Overlay Multicast with a Centralized Gateway, in a BGP EVPN VXLAN fabric.

## Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication

This example shows how to configure Optimized Layer 2 Multicast across Layer 2 overlays in an EVPN VXLAN fabric that has ingress replication enabled in the underlay.

Figure 4: Topology for Optimized Layer 2 Overlay Multicast for IPv4 Traffic with Ingress Replication



The topology shows an EVPN VXLAN network with the source connected to Layer 2 VTEP 1 and a receiver connected to Layer 2 VTEP 3. Centralized Gateway is configured on VTEP 2. VLAN 101 has IGMPv2 and VLAN 102 has IGMPv3 enabled. The following tables provide sample configurations for the devices in this topology.

Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication

Table 1: Configure VTEP 1, CGW, and VTEP 3 for Optimized Layer 2 Multicast for IPv4, with Ingress Replication

VTEP 1	CGW	VTEP 3
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VTEP 1	CGW	VTEP 3
<pre>Leaf-01#show running-config hostname Leaf-01 ! ip routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.3 ip igmp snooping querier ! l2vpn evpn replication-type ingress multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/5 switchport access vlan 102 switchport mode access ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access</pre>	<pre>Leaf-02#show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 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 vrf green ! l2vpn evpn replication-type ingress router-id Loopback1 default-gateway advertise multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.1.255.4 255.255.255.255 ip pim sparse-mode ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip ospf network point-to-point ip ospf 1 area 0</pre>	<pre>Leaf-03#show running-config end hostname Leaf-03 ! ip routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.6 ip igmp snooping querier ! l2vpn evpn replication-type ingress multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface</pre>

## Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication

VTEP 1	CGW	VTEP 3
<pre> ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>	<pre> ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! ! interface GigabitEthernet1/0/11 switchport access vlan 102 switchport mode access spanning-tree portfast ! 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 ip igmp version 3 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 </pre>	<pre> TenGigabitEthernet1/0/11 switchport access vlan 102 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>

VTEP 1	CGW	VTEP 3
	<pre> 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 static redistribute connected exit-address-family ! ip pim vrf green rp-address 10.1.255.4 ! end                     </pre>	

Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication

Table 2: Configure Spine Switch 1 and Spine Switch 2 for Optimized Layer 2 Multicast for IPv4, with Ingress Replication

Spine Switch 1	Spine Switch 2
----------------	----------------



Spine Switch 1	Spine Switch 2
<pre> Spine-01#show running-config hostname Spine-01 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 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 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 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 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both 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 </pre>	<pre> Spine-02#show running-config hostname Spine-02 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 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 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 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 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both 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 </pre>

Spine Switch 1	Spine Switch 2
neighbor 172.16.255.6 route-reflector-client exit-address-family ! end	neighbor 172.16.255.6 route-reflector-client exit-address-family ! end

To return, click [Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication, on page 11](#)

To return to the Configuration Examples section, click [Configuration Examples for Optimized Layer 2 Overlay Multicast, on page 10](#).

## Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication in the Underlay

The following sections provide sample output of the **show** commands to verify Optimized Layer 2 Overlay Multicast with Ingress Replication on the devices in the [Figure 4: Topology for Optimized Layer 2 Overlay Multicast for IPv4 Traffic with Ingress Replication](#).

[Outputs to Verify Configuration on VTEP 1](#)

[Outputs to Verify Configuration on CGW](#)

[Outputs to Verify Configuration on VTEP 3](#)

### Outputs to Verify Configuration on VTEP 1

```
Leaf-01# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address          EVI   VLAN  MAC Address      Source
-----
Y   10.1.101.1                          101   101   7c21.0dbd.9541  172.16.254.4
```

```
Leaf-01# show ip igmp snooping querier vlan 101
IP address           : 172.16.254.3
IGMP version         : v3
Port                  : Switch
Max response time    : 10s
Query interval       : 60s
Robustness variable  : 2
```

```
Leaf-01# show ip igmp snooping groups vlan 101
Vlan   Group           Type           Version   Port List
-----
101    239.1.1.1         igmp          v2        Tu0
```

```
Leaf-01# show l2vpn evpn evi 101 detail
EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.3:101 (auto)
Import-RTs:         65001:101
Export-RTs:         65001:101
Per-EVI Label:      none
State:              Established
Replication Type:   Ingress (global)
Encapsulation:      vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway:  Disabled (global)
Re-originate RT5:   Disabled
Adv. Multicast:     Enabled (global)
```

```
Vlan: 101
Protected: False
Ethernet-Tag: 0
State: Established
Flood Suppress: Attached
Core If:
Access If:
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10101
L3 VNI: 0
VTEP IP: 172.16.254.3
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 0 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 1 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 0 MAC/IP, 1 IMET, 0 EAD
```

```
Leaf-01# show l2vpn evpn multicast local address 239.1.1.1
EVI  VLAN  Interface          Version  Filter (Source, Group)
-----
```

```
Leaf-01# show l2vpn evpn multicast remote address 239.1.1.1
EVI  VLAN  Originator          Version  Filter (Source, Group)
-----
101  101   172.16.254.4       IGMPv2  N/A    (*, 239.1.1.1)
101  101   172.16.254.6       IGMPv2  N/A    (*, 239.1.1.1)
```

```
Leaf-01# show l2route evpn multicast routes group 239.1.1.1
EVI  ETAG  Group
Source  Next-hop(s)
-----
101  0     239.1.1.1 *          V:10101 172.16.254.6, V:10101 172.16.254.4
```

```
Leaf-01# show l2route evpn multicast smet group 239.1.1.1
EVI  ETAG  Origin          Group          Filter  Source(s)
-----
101  0     172.16.254.4   239.1.1.1     N/A    (*) IGMPv2
101  0     172.16.254.6   239.1.1.1     N/A    (*) IGMPv2
```

```
Leaf-01# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.4
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 87
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from [6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23
  (global)
    172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 4 2022 20:02:18 UTC
BGP routing table entry for
```

```
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 77
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 4 2022 20:02:18 UTC
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 4 2022 20:02:18 UTC

Leaf-01# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.6
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 192
Paths: (1 available, best #1, table evi_101)
Not advertised to any peer
Refresh Epoch 2
Local, imported path from [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23
(global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 4 2022 20:03:54 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 191
Paths: (2 available, best #1, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 4 2022 20:03:54 UTC
Refresh Epoch 2
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 4 2022 20:03:54 UTC
```

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication in the Underlay](#), on page 18.

### Outputs to Verify Configuration on CGW

```
Leaf-02# show l2vpn evpn default-gateway vlan 102
Valid Default Gateway Address      EVI   VLAN  MAC Address  Source
-----
Y   10.1.102.1                     102   102   7c21.0dbd.954d V1102
```

```
Leaf-02# show ip igmp snooping querier vlan 102
IP address      : 10.1.102.1
IGMP version    : v3
Port            : Router
Max response time : 10s
Query interval  : 60s
Robustness variable : 2
```

```
Leaf-02# show ip igmp snooping groups vlan 102
Version  Port List  Group  Type
-----
102     239.1.1.2  igmp   v3      G11/0/11, Tu0
```

```
Leaf-02#show l2vpn evpn evi 102 detail
EVPN instance: 102 (VLAN Based)
RD: 172.16.254.4:102 (auto)
Import-RTs: 65001:102
Export-RTs: 65001:102
Per-EVI Label: none
State: Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 102
Protected: False
Ethernet-Tag: 0
State: Established
Flood Suppress: Attached
Core If:
Access If: Vlan102
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10102
L3 VNI: 0
VTEP IP: 172.16.254.4
VRF:
IPv4 IRB: Enabled (Asymmetric)
IPv6 IRB: Disabled
Pseudoports:
  GigabitEthernet1/0/11 service instance 102
    Routes: 1 MAC, 0 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 0 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 0 MAC/IP, 1 IMET, 0 EAD
```

```
Leaf-02# show l2vpn evpn multicast local address 239.1.1.2
EVI  VLAN  Interface  Version  Filter (Source, Group)
```

```
-----
102 102 Gi1/0/11 IGMPv3 INCLUDE (10.1.102.11, 239.1.1.2)
```

```
Leaf-02# show l2vpn evpn multicast remote address 239.1.1.2
```

```
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----
102  102   172.16.254.6        IGMPv3   INCLUDE (10.1.102.11, 239.1.1.2)
```

```
Leaf-02# show l2route evpn multicast routes group 239.1.1.2
```

```
EVI  ETAG    Group          Source          Next-hop(s)
-----
102  0        239.1.1.2      *               Gi1/0/11:102, v:10102 172.16.254.6
```

```
Leaf-02# show l2route evpn multicast smet group 239.1.1.2
```

```
EVI  ETAG    Origin          Group          Filter  Source(s)
-----
102  0        Gi1/0/11:102   239.1.1.2     INCLUDE 10.1.102.11
102  0        172.16.254.6   239.1.1.2     INCLUDE 10.1.102.11
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.4
```

```
BGP routing table entry for
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 116
Paths: (1 available, best #1, table evi_102)
```

```
  Advertised to update-groups:
```

```
    1
```

```
  Refresh Epoch 1
```

```
  Local
```

```
    :: (via default) from 0.0.0.0 (172.16.255.4)
```

```
    Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
```

```
    IGMP/MLD v3
```

```
    Extended Community: RT:65001:102 ENCAP:8
```

```
    Local irb vxlan vtep:
```

```
      vrf:not found, l3-vni:0
```

```
      local router mac:0000.0000.0000
```

```
      core-irb interface:(not found)
```

```
      vtep-ip:172.16.254.4
```

```
    rx pathid: 0, tx pathid: 0x0
```

```
    Updated on Apr 4 2022 20:02:21 UTC
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.6
```

```
BGP routing table entry for
```

```
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.6]/27, version 186
Paths: (1 available, best #1, table evi_102)
```

```
  Not advertised to any peer
```

```
  Refresh Epoch 2
```

```
  Local, imported path from
```

```
[6][172.16.254.6:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.6]/27 (global)
```

```
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
```

```
    Origin incomplete, metric 0, localpref 100, valid, internal, best
```

```
    IGMP/MLD v3
```

```
    Extended Community: RT:65001:102 ENCAP:8
```

```
    Originator: 172.16.255.6, Cluster list: 172.16.255.1
```

```
    rx pathid: 0, tx pathid: 0x0
```

```
    Updated on Apr 4 2022 20:03:50 UTC
```

```
BGP routing table entry for
```

```
[6][172.16.254.6:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.6]/27, version 184
Paths: (2 available, best #2, table EVPN-BGP-Table)
```

```
  Not advertised to any peer
```

```
  Refresh Epoch 2
```

```

Local
 172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 4 2022 20:03:50 UTC
Refresh Epoch 2
Local
 172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 4 2022 20:03:50 UTC

Leaf-02# show ip mroute vrf green 239.1.1.2
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                        t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.2), 01:05:00/00:02:58, RP 10.1.255.4, flags: SJC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:44:20/00:02:58, flags:

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication in the Underlay](#), on page 18.

### Outputs to Verify Configuration on VTEP 3

```

Leaf-03# show l2vpn evpn default-gateway vlan 102 Valid Default Gateway Address
      EVI   VLAN   MAC Address      Source
-----
  Y   10.1.102.1           102   102   7c21.0dbd.954d 172.16.254.4

Leaf-03# show ip igmp snooping querier vlan 102
IP address      : 172.16.254.6
IGMP version    : v3
Port            : Switch
Max response time : 10s
Query interval  : 60s
Robustness variable : 2

```

Leaf-03# **show ip igmp snooping groups vlan 102**

Vlan	Group	Type	Version	Port List
102	239.1.1.2	igmp	v3	Tel/0/11, Tu0

Leaf-03# **show l2vpn evpn evi 102 detail**EVPN instance: 102 (VLAN Based)

```

RD: 172.16.254.6:102 (auto)
Import-RTs: 65001:102
Export-RTs: 65001:102
Per-EVI Label: none
State: Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 102
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
Core If:
Access If:
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10102
L3 VNI: 0
VTEP IP: 172.16.254.6
Pseudoports:
  TenGigabitEthernet1/0/11 service instance 102
    Routes: 1 MAC, 0 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 0 MAC/IP, 1 IMET, 0 EAD
  172.16.254.4
    Routes: 2 MAC, 1 MAC/IP, 1 IMET, 0 EAD

```

Leaf-03# **show l2vpn evpn multicast local address 239.1.1.2**

EVI	VLAN	Interface	Version	Filter	(Source, Group)
102	102	Tel/0/11	IGMPv3	INCLUDE	(10.1.102.11, 239.1.1.2)

Leaf-03# **show l2vpn evpn multicast remote address 239.1.1.2**

EVI	VLAN	Originator	Version	Filter	(Source, Group)
102	102	172.16.254.4	IGMPv3	INCLUDE	(10.1.102.11, 239.1.1.2)

Leaf-03# **show l2route evpn multicast routes group 239.1.1.2**

EVI	ETAG	Group	Source	Next-hop(s)
102	0	239.1.1.2	*	Tel/0/11:102, V:10102 172.16.254.4

Leaf-03# **show l2route evpn multicast smet group 239.1.1.2**

EVI	ETAG	Origin
Group	Filter	Source(s)
102	0	Tel/0/11:102
102	0	172.16.254.4



```

Leaf-03# show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 208
Paths: (2 available, best #1, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v3
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 4 2022 20:02:21 UTC
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v3
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 4 2022 20:02:21 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 210
Paths: (1 available, best #1, table evi_102)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
    [6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27 (global)
      172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
        Origin incomplete, metric 0, localpref 100, valid, internal, best
        IGMP/MLD v3
        Extended Community: RT:65001:102 ENCAP:8
        Originator: 172.16.255.4, Cluster list: 172.16.255.1
        rx pathid: 0, tx pathid: 0x0
        Updated on Apr 4 2022 20:02:21 UTC

Leaf-03# show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.6
BGP routing
table entry for [6][172.16.254.6:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.6]/27,
version 230
Paths: (1 available, best #1, table evi_102)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
    :: (via default) from 0.0.0.0 (172.16.255.6)
      Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
      IGMP/MLD v3
      Extended Community: RT:65001:102 ENCAP:8
      Local irb vxlan vtep:
        vrf:not found, l3-vni:0
        local router mac:0000.0000.0000
        core-irb interface:(not found)
        vtep-ip:172.16.254.6
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 4 2022 20:03:50 UTC

```

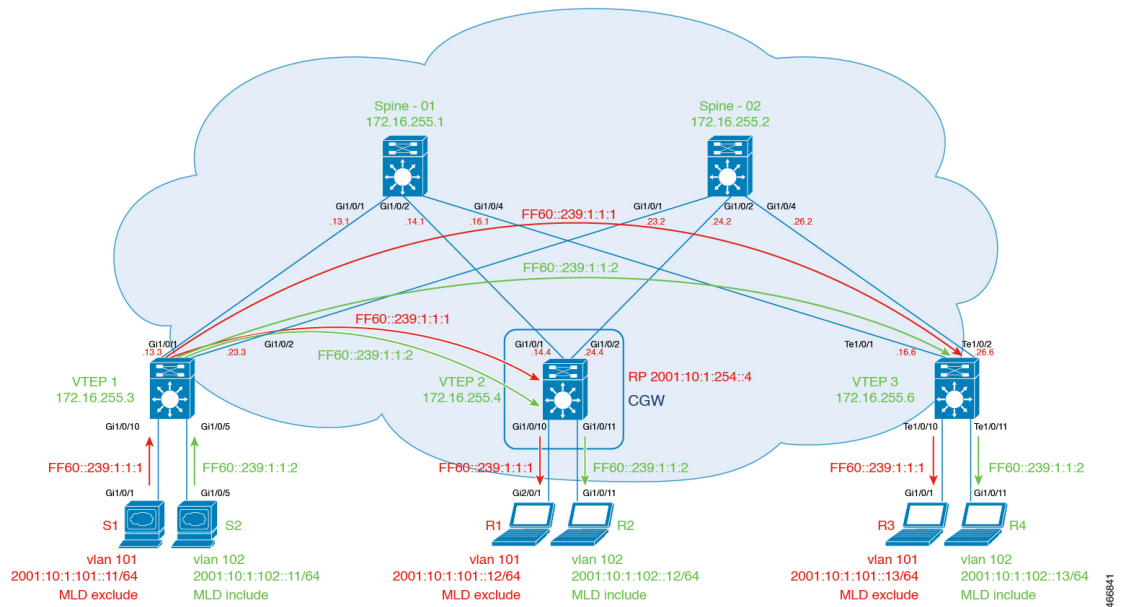
To return, click [Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication](#).

## Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6

This example shows how to configure Optimized Layer 2 Overlay Multicast across the Layer 2 overlays in an EVPN VXLAN fabric that has ingress replication enabled in the underlay. The example configuration is for both IPv4 and IPv6 multicast traffic.

For IPv4 multicast traffic, refer [Figure 4: Topology for Optimized Layer 2 Overlay Multicast for IPv4 Traffic with Ingress Replication](#).

**Figure 5: Topology for Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv6 Traffic**



The topology shows an EVPN VXLAN network with the source connected to Layer 2 VTEP 1 and receivers connected to Layer 2 VTEP 3. A Centralized Gateway is configured on VTEP 2. VLAN 101 has MLD exclude mode and VLAN 102 has MLD include mode. The following tables provide sample configurations for IPv4 and IPv6 multicast traffic for the devices in this topology:

*Table 3: Configure VTEP 1, CGW, and VTEP 3 for Optimized Layer 2 Multicast for IPv4 and IPv6, with Ingress Replication*

VTEP1	CGW	VTEP 3
-------	-----	--------

## Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6

VTEP1	CGW	VTEP 3
<pre> Leaf-01#show running-config hostname Leaf-01 ! ip routing !  ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.3 ip igmp snooping querier ! ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping ! l2vpn evpn replication-type ingress router-id Loopback1 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! </pre>	<pre> Leaf-02#show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 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 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 ! ipv6 unicast-routing ipv6 mld snooping ipv6 multicast-routing vrf green ! l2vpn evpn replication-type ingress router-id Loopback1 default-gateway advertise multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip ospf 1 area 0 ! </pre>	<pre> Leaf-03#show running-config hostname Leaf-03 ! ip routing !  ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.6 ip igmp snooping querier ! ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping ! l2vpn evpn replication-type ingress router-id Loopback1 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 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 ospf network point-to-point </pre>

VTEP1	CGW	VTEP 3
<pre> interface GigabitEthernet1/0/5 switchport access vlan 102 switchport mode access ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>	<pre> interface Loopback255 vrf forwarding green ip address 10.1.255.4 255.255.255.255 ip pim sparse-mode ipv6 address 2001:10:1:255::4/128 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface GigabitEthernet1/0/11 switchport access vlan 102 switchport mode access spanning-tree portfast ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address 2001:10:1:101::1/64 ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ip igmp version 3 ipv6 address 2001:10:1:102::1/64 ! interface Vlan901 no ip address ipv6 enable ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication </pre>	<pre> ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface TenGigabitEthernet1/0/11 switchport access vlan 102 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>

## Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6

VTEP1	CGW	VTEP 3
	<pre> ! 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 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 static redistribute connected exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim vrf green rp-address 10.1.255.4 ipv6 pim vrf green rp-address 2001:10:1:255::4 ! end </pre>	

*Table 4: Configure Spine Switch 1 and Spine Switch 2 for Optimized Layer 2 Multicast for IPv4 and IPv6, with Ingress Replication*

Spine Switch 1	Spine Switch 2
----------------	----------------

## Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6

Spine Switch 1	Spine Switch 2
<pre> Spine-01#show running-config hostname Spine-01 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 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 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 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 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both 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 </pre>	<pre> Spine-02#show running-config hostname Spine-02 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 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 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 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 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both 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 </pre>



Spine Switch 1	Spine Switch 2
neighbor 172.16.255.6 route-reflector-client exit-address-family ! end	neighbor 172.16.255.6 route-reflector-client exit-address-family ! end

To return, click [Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6](#), on page 26.

To return to the Configuration Examples section, click [Configuration Examples for Optimized Layer 2 Overlay Multicast](#), on page 10.

## Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic

The following sections provide sample output of **show** commands to verify Optimized Layer 2 Overlay Multicast with Ingress Replication on the devices in the [Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6](#).

To see the output of the **show** commands for IPv4 multicast traffic, go to [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication in the Underlay](#), on page 18.

The output of the **show** commands for IPv6 multicast traffic are provided in the following sections.

[Outputs to Verify Configuration on VTEP 1](#)

[Outputs to Verify Configuration on CGW](#)

[Outputs to Verify Configuration on VTEP 3](#)

[Outputs to Verify Configuration on Spine Switch 1](#)

[Outputs to Verify Configuration on Spine Switch 2](#)

### Outputs to Verify Configuration on VTEP 1

Verify the configuration with MLD exclude.

```
Leaf-01# show l2vpn evpn default-gateway vlan 101 Valid Default Gateway Address
      EVI   VLAN   MAC Address      Source
-----
      Y    10.1.101.1           101   101   7c21.0dbd.9541 172.16.254.4
      Y    2001:10:1:101::1       101   101   7c21.0dbd.9541 172.16.254.4
```

```
Leaf-01# show ipv6 mld snooping querier vlan 101
IP address           : FE80:0:4A56:0:12B3:D5FF:FE6A:8F80
MLD version          : v2
Port                 : Switch
Max response time    : 10s
Query interval       : 125s
Robustness variable  : 2
```

```
Leaf-01# show ipv6 mld snooping membership vlan 101
```

```
Snooping Membership Summary for Vlan 101
-----
Total number of channels: 2
Total number of hosts   : 2
```

```
Source/Group          Interface Reporter          Vlan Uptime
```

Last-Join/				Last-Leave
::/FF06::239:1:1:1 20:14:25 /	Tu0	FE80::AC10:FE04	101	20:14:25 -
::/FF06::239:1:1:1 20:13:50 /	Tu0	FE80::AC10:FE06	101	20:13:50 -
::/FF06:239:1:1::1 20:15:23 /	Tu0	FE80::AC10:FE04	101	00:00:48 20:14:34
::/FF06:239:1:1::1 20:15:10 /	Tu0	FE80::AC10:FE06	101	00:01:11 20:13:59

Leaf-01# show l2vpn evpn evi 101 detail

```

EVPN instance: 101 (VLAN Based)
RD: 172.16.254.3:101 (auto)
Import-RTs: 65001:101
Export-RTs: 65001:101
Per-EVI Label: none
State: Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 101
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
Core If:
Access If:
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10101
L3 VNI: 0
VTEP IP: 172.16.254.3
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
    
```

Leaf-01# show l2vpn evpn multicast local address FF06::239:1:1:1EVI VLAN Interface

```

Version Filter (Source, Group)
-----
    
```

```
Leaf-01# show l2vpn evpn multicast remote address FF06::239:1:1:1
EVI   VLAN  Originator          Version  Filter  (Source, Group)
-----
101   101   172.16.254.4        MLDv2   EXCLUDE (*, FF06::239:1:1:1)
101   101   172.16.254.6        MLDv2   EXCLUDE (*, FF06::239:1:1:1)
```

```
Leaf-01# show l2route evpn multicast routes group FF06::239:1:1:1
EVI   ETAG    Group              Source
      Next-hop(s)
-----
101   0       FF06::239:1:1:1   ::
      V:10101 172.16.254.4, Gi1/0/10:101, V:10101 172.16.254.6
```

```
Leaf-01# show l2route evpn multicast smet group FF06::239:1:1:1
EVI   ETAG    Origin
Group Filter  Source(s)
-----
101   0       172.16.254.4     FF06::239:1:1:1   EXCLUDE
(*)MLDv2
101   0       172.16.254.6     FF06::239:1:1:1   EXCLUDE
(*)MLDv2
```

```
Leaf-01# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 121
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35 (global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 6 2022 16:06:25 UTC
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 120
Paths: (2 available, best #1, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 6 2022 16:06:25 UTC
  Refresh Epoch 1
  Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 6 2022 16:06:25 UTC
```

```

Leaf-01# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 131
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35 (global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.6, Cluster list: 172.16.255.1
    rx pathid: 0, tx pathid: 0x0
    Updated on Apr 6 2022 16:07:00 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 129
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 6 2022 16:07:00 UTC
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 6 2022 16:07:00 UTC

```

### Verify the configuration with MLD include.

```

Leaf-01# show l2vpn evpn default-gateway vlan 102
Valid Default Gateway Address      EVI   VLAN  MAC Address      Source
-----
Y   10.1.102.1                102   102   7c21.0dbd.954d  172.16.254.4
Y   2001:10:1:102::1          102   102   7c21.0dbd.954d  172.16.254.4

```

```

Leaf-01# show ipv6 mld snooping querier vlan 102
IP address      : FE80:0:4A56:0:12B3:D5FF:FE6A:8F80
MLD version     : v2
Port           : Switch
Max response time : 10s
Query interval  : 125s
Robustness variable : 2

```

```

Leaf-01# show ipv6 mld snooping membership vlan 102 source 2001:10:1:102::11 group
FF06::239:1:1:2Source/Group      Interface Reporter
Vlan Uptime   Last-Join/
-----
2001:10:1:102::11/FF06::239:1:1:2 \

```

```

00:02:56 / Tu0 FE80::AC10:FE04 102 00:02:56
-
2001:10:1:102::11/FF06::239:1:1:2 \
00:02:56 / Tu0 FE80::AC10:FE06 102 00:02:56

```

Leaf-01# show l2vpn evpn evi 102 detail

```

EVPN instance: 102 (VLAN Based)
RD: 172.16.254.3:102 (auto)
Import-RTs: 65001:102
Export-RTs: 65001:102
Per-EVI Label: none
State: Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 102
Protected: False
Ethernet-Tag: 0
State: Established
Flood Suppress: Attached
Core If:
Access If:
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10102
L3 VNI: 0
VTEP IP: 172.16.254.3
Pseudoports:
  GigabitEthernet1/0/5 service instance 102
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD

```

Leaf-01#show l2vpn evpn multicast local address FF06::239:1:1:2

```

EVI  VLAN  Interface      Version  Filter (Source, Group)
-----

```

Leaf-01# show l2vpn evpn multicast remote address FF06::239:1:1:2

```

EVI  VLAN  Originator      Version  Filter (Source, Group)
-----
102  102   172.16.254.4    MLDv2   INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)
102  102   172.16.254.6    MLDv2   INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)

```

Leaf-01# show l2route evpn multicast routes group FF06::239:1:1:2

```

EVI  ETAG  Group              Source
-----
      Next-hop(s)
-----
102  0     FF06::239:1:1:2   ::
      V:10102 172.16.254.4, V:10102 172.16.254.6, Gi1/0/5:102

```

```

Leaf-01# show l2route evpn multicast smet group FF06::239:1:1:2EVI ETAG Origin
          Group                               Filter      Source(s)
-----
102 0      172.16.254.4                               FF06::239:1:1:2      INCLUDE
2001:10:1:102::11
102 0      172.16.254.6                               FF06::239:1:1:2      INCLUDE
2001:10:1:102::11

Leaf-01# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.4BGP
routing table entry for
[6][172.16.254.3:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 87
Paths: (1 available, best #1, table evi_102)
Not advertised to any peer
Refresh Epoch 2
Local, imported path from
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51
(global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 13:45:47 UTC
BGP routing table entry for
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 35
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 7 2022 13:44:53 UTC
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 13:44:53 UTC

Leaf-01# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.6
BGP routing table entry for
[6][172.16.254.3:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 95
Paths: (1 available, best #1, table evi_102)
Not advertised to any peer
Refresh Epoch 2
Local, imported path from
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51
(global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2

```

```

Extended Community: RT:65001:102 ENCAP:8
Originator: 172.16.255.6, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on Apr 7 2022 13:45:47 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 39
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 7 2022 13:44:53 UTC
Refresh Epoch 2
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 13:44:53 UTC

```

To return click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic](#), on page 33.

## Outputs to Verify Configuration on CGW

Verify the configuration with MLD exclude.

```
Leaf-02# show l2vpn evpn default-gateway vlan 101
```

Valid	Default Gateway Address	EVI	VLAN	MAC Address	Source
Y	10.1.101.1	101	101	7c21.0dbd.9541	V1101
Y	2001:10:1:101::1	101	101	7c21.0dbd.9541	V1101

```
Leaf-02# show ipv6 mld snooping querier vlan 101
```

```

IP address      : FE80::46D3:CAFF:FE28:6CC1
MLD version    : v2
Port           : Gi1/0/10
Max response time : 10s
Query interval  : 125s
Robustness variable : 2

```

```
Leaf-02# show ipv6 mld snooping membership vlan 101
```

```
Snooping Membership Summary for Vlan 101
```

```

-----
Total number of channels: 2
Total number of hosts   : 2

```

Source/Group	Interface Reporter	Vlan Uptime	Last-Join/	Last-Leave
-----				

```

::/FF06::239:1:1:1          Gi1/0/10  FE80::46D3:CAFF:FE28:6CC1      101  00:00:00
00:00:05 /
                                00:00:05

::/FF06:239:1:1::1         Gi1/0/10  FE80::46D3:CAFF:FE28:6CC1      101  00:00:47
20:16:44 /
                                20:15:56

::/FF06::239:1:1:1          Tu0       FE80::AC10:FE06                 101  20:15:12
20:15:12 /
                                -

::/FF06:239:1:1::1         Tu0       FE80::AC10:FE06                 101  00:00:00
20:15:21 /
                                20:15:21

```

Leaf-02# **show l2vpn evpn evi 101 detail**

```

EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.4:101 (auto)
Import-RTs:        65001:101
Export-RTs:        65001:101
Per-EVI Label:     none
State:             Established
Replication Type:   Ingress (global)
Encapsulation:     vxlan
IP Local Learn:    Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5: Disabled
Adv. Multicast:    Enabled (global)
Vlan:              101
  Protected:       False
  Ethernet-Tag:    0
  State:           Established
  Flood Suppress:  Attached
  Core If:
  Access If:      Vlan101
  NVE If:         nve1
  RMAC:           0000.0000.0000
  Core Vlan:      0
  L2 VNI:         10101
  L3 VNI:         0
  VTEP IP:        172.16.254.4
  VRF:
  IPv4 IRB:       Enabled (Asymmetric)
  IPv6 IRB:       Enabled (Asymmetric)
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD

```

Leaf-02# **show l2vpn evpn multicast local address FF06::239:1:1:1**

```

EVI  VLAN  Interface      Version  Filter  (Source, Group)
-----

```



```
101 101 Gi1/0/10 MLDv2 EXCLUDE (*, FF06::239:1:1:1)
```

```
Leaf-02# show l2vpn evpn multicast remote address FF06::239:1:1:1
EVI VLAN Originator Version Filter (Source, Group)
-----
101 101 172.16.254.6 MLDv2 EXCLUDE (*, FF06::239:1:1:1)
```

```
Leaf-02# show l2route evpn multicast routes group FF06::239:1:1:1
EVI ETAG Group Source
Next-hop(s)
-----
101 0 FF06::239:1:1:1 ::
Gi1/0/10:101, V:10101 172.16.254.3, V:10101 172.16.254.6
```

```
Leaf-02# show l2route evpn multicast smet group FF06::239:1:1:1
EVI ETAG Origin
Group Filter Source(s)
-----
101 0 Gi1/0/10:101 FF06::239:1:1:1 EXCLUDE
(*)MLDv2
101 0 172.16.254.6 FF06::239:1:1:1 EXCLUDE
(*)MLDv2
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 117
Paths: (1 available, best #1, table evi_101)
Advertised to update-groups:
1
Refresh Epoch 1
Local
:: (via default) from 0.0.0.0 (172.16.255.4)
Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
IGMP/MLD v2, exclude
Extended Community: RT:65001:101 ENCAP:8
Local irb vxlan vtep:
vrf:not found, l3-vni:0
local router mac:0000.0000.0000
core-irb interface:(not found)
vtep-ip:172.16.254.4
rx pathid: 0, tx pathid: 0x0
Updated on Apr 6 2022 16:06:25 UTC
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 126
Paths: (1 available, best #1, table evi_101)
Not advertised to any peer
Refresh Epoch 2
Local, imported path from
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35 (global)
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v2, exclude
Extended Community: RT:65001:101 ENCAP:8
Originator: 172.16.255.6, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on Apr 6 2022 16:07:00 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 124
```

```

Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 2
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 6 2022 16:07:00 UTC
  Refresh Epoch 2
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 6 2022 16:07:00 UTC

```

```

Leaf-02# show ipv6 mroute vrf green FF06::239:1:1:1
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::239:1:1:1), 20:17:15/never, RP 2001:10:1:255::4, flags: SCJ
  Incoming interface: Tunnel6
  RPF nbr: 2001:10:1:255::4
  Immediate Outgoing interface list:
    Vlan101, Forward, 20:17:15/never

(2001:10:1:101::11, FF06::239:1:1:1), 00:00:33/00:02:56, flags: SFJT
  Incoming interface: Vlan101
  RPF nbr: 2001:10:1:101::11
  Outgoing interface list: Null

```

## Configuration with MLD include

```

Leaf-02# show l2vpn evpn default-gateway vlan 102 Valid Default Gateway Address
      EVI   VLAN  MAC Address      Source
-----
Y      10.1.102.1                102   102   7c21.0dbd.954d V1102

```

```

Leaf-02# show ipv6 mld snooping querier vlan 102
IP address      : FE80::46D3:CAFF:FE28:6CC2
MLD version     : v2
Port            : Gi1/0/11
Max response time : 10s
Query interval  : 125s

```

Robustness variable : 2

```
Leaf-02# show ipv6 mld snooping membership vlan 102 source 2001:10:1:102::11 group
FF06::239:1:1:2 Source/Group          Interface Reporter
Vlan Uptime   Last-Join/                               Last-Leave
-----
2001:10:1:102::11/FF06::239:1:1:2 \
                                Gi1/0/11 FE80::46D3:CAFF:FE28:6CC2      102 00:10:26
00:00:09 /
-
2001:10:1:102::11/FF06::239:1:1:2 \
                                Tu0      FE80::AC10:FE06                          102 00:08:42
00:08:42 /
-
```

```
Leaf-02# show l2vpn evpn evi 102 detail
EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.4:102 (auto)
Import-RTs:        65001:102
Export-RTs:        65001:102
Per-EVI Label:     none
State:             Established
Replication Type:  Ingress (global)
Encapsulation:    vxlan
IP Local Learn:   Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5: Disabled
Adv. Multicast:   Enabled (global)
Vlan:             102
  Protected:      False
  Ethernet-Tag:   0
  State:         Established
  Flood Suppress: Attached
Core If:
Access If:        Vlan102
NVE If:          nve1
RMAC:            0000.0000.0000
Core Vlan:       0
L2 VNI:          10102
L3 VNI:          0
VTEP IP:         172.16.254.4
VRF:
IPv4 IRB:        Enabled (Asymmetric)
IPv6 IRB:        Enabled (Asymmetric)
Pseudoports:
  GigabitEthernet1/0/11 service instance 102
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
```

```
Leaf-02# show l2vpn evpn multicast local address FF06::239:1:1:2EVI  VLAN  Interface
Version  Filter  (Source, Group)
-----
```

```
102 102 Gi1/0/11 MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)
```

```
Leaf-02# show l2vpn evpn multicast remote address FF06::239:1:1:2
```

```
EVI VLAN Originator Version Filter (Source, Group)
```

```
-----
102 102 172.16.254.6 MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)
```

```
Leaf-02# show l2route evpn multicast routes group FF06::239:1:1:2
```

```
EVI ETAG Group Source
Next-hop(s)
```

```
-----
102 0 FF06::239:1:1:2 ::
    Gi1/0/11:102, V:10102 172.16.254.3, V:10102 172.16.254.6
```

```
Leaf-02# show l2route evpn multicast smet group FF06::239:1:1:2
```

```
EVI ETAG Origin Group Filter
Source(s)
```

```
-----
102 0 Gi1/0/11:102 FF06::239:1:1:2 INCLUDE
2001:10:1:102::11
102 0 172.16.254.6 FF06::239:1:1:2 INCLUDE
2001:10:1:102::11
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.4
```

```
BGP routing table entry for
```

```
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 143
```

```
Paths: (1 available, best #1, table evi_102)
```

```
Advertised to update-groups:
```

```
1
```

```
Refresh Epoch 1
```

```
Local
```

```
:: (via default) from 0.0.0.0 (172.16.255.4)
```

```
Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
IGMP/MLD v2
```

```
Extended Community: RT:65001:102 ENCAP:8
```

```
Local irb vxlan vtep:
```

```
vrf:not found, l3-vni:0
```

```
local router mac:0000.0000.0000
```

```
core-irb interface:(not found)
```

```
vtep-ip:172.16.254.4
```

```
rx pathid: 0, tx pathid: 0x0
```

```
Updated on Apr 7 2022 13:39:42 UTC
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.6
```

```
BGP routing table entry for
```

```
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 164
```

```
Paths: (1 available, best #1, table evi_102)
```

```
Not advertised to any peer
```

```
Refresh Epoch 2
```

```
Local, imported path from
```

```
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51
(global)
```

```
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best
```

```
IGMP/MLD v2
```

```
Extended Community: RT:65001:102 ENCAP:8
```

```
Originator: 172.16.255.6, Cluster list: 172.16.255.1
```

```
rx pathid: 0, tx pathid: 0x0
```

```

Updated on Apr 7 2022 13:41:25 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 160
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
Origin incomplete, metric 0, localpref 100, valid, internal
IGMP/MLD v2
Extended Community: RT:65001:102 ENCAP:8
Originator: 172.16.255.6, Cluster list: 172.16.255.2
rx pathid: 0, tx pathid: 0
Updated on Apr 7 2022 13:41:25 UTC
Refresh Epoch 3
Local
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v2
Extended Community: RT:65001:102 ENCAP:8
Originator: 172.16.255.6, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on Apr 7 2022 13:44:52 UTC

```

```

Leaf-02# show ipv6 mroute vrf green FF06::239:1:1:2
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

(2001:10:1:102::11, FF06::239:1:1:2), 00:14:17/00:00:37, flags: SFTI
Incoming interface: Vlan102
RPF nbr: 2001:10:1:102::11
Outgoing interface list: Null

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic](#), on page 33.

### Outputs to Verify Configuration on VTEP 3

#### MLD exclude

```

Leaf-03# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address          EVI   VLAN   MAC Address      Source
-----
Y   10.1.101.1                          101   101    7c21.0dbd.9541   172.16.254.4
Y   2001:10:1:101::1                     101   101    7c21.0dbd.9541   172.16.254.4

```

```

Leaf-03# show ipv6 mld snooping querier vlan 101
IP address          : FE80:0:8155:0:E75:BDFE:FE67:EF00

```

```

MLD version          : v2
Port                 : Switch
Max response time    : 10s
Query interval       : 125s
Robustness variable  : 2

```

```

Leaf-03# show ipv6 mld snooping membership vlan 101
Snooping Membership Summary for Vlan 101
-----

```

```

Total number of channels: 2
Total number of hosts   : 2

```

Source/Group Last-Join/	Interface Reporter	Vlan Uptime	Last-Leave
::/FF06::239:1:1:1 00:00:57 /	Tel1/0/10 FE80::EEE1:A9FF:FE37:92C1	101 00:00:00	00:00:57
::/FF06:239:1:1::1 20:25:57 /	Tel1/0/10 FE80::EEE1:A9FF:FE37:92C1	101 00:01:07	20:24:49
::/FF06::239:1:1:1 20:25:16 /	Tu0 FE80::AC10:FE04	101 20:25:16	-
::/FF06:239:1:1::1 20:26:13 /	Tu0 FE80::AC10:FE04	101 00:00:48	20:25:25

```

Leaf-03# show l2vpn evpn evi 101 detail
EVPN instance: 101 (VLAN Based)
RD: 172.16.254.6:101 (auto)
Import-RTs: 65001:101
Export-RTs: 65001:101
Per-EVI Label: none
State: Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 101
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
  Core If:
  Access If:
  NVE If: nve1
  RMAC: 0000.0000.0000
  Core Vlan: 0
  L2 VNI: 10101
  L3 VNI: 0
  VTEP IP: 172.16.254.6
Pseudoports:

```

```
TenGigabitEthernet1/0/10 service instance 101
  Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 1 IMET, 0 EAD
```

```
Leaf-03# show l2vpn evpn multicast local address FF06::239:1:1:1EVI  VLAN  Interface
      Version  Filter  (Source, Group)
-----
101  101  Te1/0/10          MLDv2      EXCLUDE (*, FF06::239:1:1:1)
```

```
Leaf-03# show l2vpn evpn multicast remote address FF06::239:1:1:1EVI  VLAN  Originator
      Version  Filter  (Source, Group)
-----
101  101  172.16.254.4      MLDv2      EXCLUDE (*, FF06::239:1:1:1)
```

```
Leaf-03# show l2route evpn multicast routes group FF06::239:1:1:1EVI  ETAG      Group
                                     Source      Next-hop(s)
-----
101  0          FF06::239:1:1:1          ::
      V:10101 172.16.254.4, V:10101 172.16.254.3, Te1/0/10:101
```

```
Leaf-03# show l2route evpn multicast smet group FF06::239:1:1:1
EVI  ETAG      Origin      Group      Filter
Source(s)
-----
101  0          Te1/0/10:101      FF06::239:1:1:1      EXCLUDE
(*)MLDv2
101  0          172.16.254.4      FF06::239:1:1:1      EXCLUDE
(*)MLDv2
```

```
Leaf-03# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4BGP routing table
entry for [6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version
105
Paths: (2 available, best #1, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 6 2022 16:06:25 UTC
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 6 2022 16:06:25 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 106
```

```

Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35 (global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 6 2022 16:06:25 UTC

```

```

Leaf-03# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 111
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Local irb vxlan vtep:
    vrf: not found, l3-vni:0
    local router mac:0000.0000.0000
    core-irb interface:(not found)
    vtep-ip:172.16.254.6
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 6 2022 16:07:00 UTC

```

### Verify the configuration with MLD include.

```

Leaf-03# show l2vpn evpn default-gateway vlan 102 Valid Default Gateway Address
-----
EVI   VLAN  MAC Address      Source
-----
Y     10.1.102.1      102 102 7c21.0dbd.954d 172.16.254.4
Y     2001:10:1:102::1 102 102 7c21.0dbd.954d 172.16.254.4

```

```

Leaf-03# show ipv6 mld snooping querier vlan 102
IP address           : FE80:0:8155:0:E75:BDF:FE67:EF00
MLD version          : v2
Port                  : Switch
Max response time     : 10s
Query interval        : 125s
Robustness variable   : 2

```

```

Leaf-03# show ipv6 mld snooping membership vlan 102 source 2001:10:1:102::11 group
FF06::239:1:1:2
Source/Group          Interface Reporter          Vlan Uptime
Last-Join/                               Last-Leave
-----
2001:10:1:102::11/FF06::239:1:1:2 \
00:00:25 /                               Tel1/0/11 FE80::EEE1:A9FF:FE37:92C2 102 00:11:00

```



```

2001:10:1:102::11/FF06::239:1:1:2 \
                                Tu0      FE80::AC10:FE04          102  00:12:44
00:12:44 /
    
```

Leaf-03# **show l2vpn evpn evi 102 detail**

```

EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.6:102 (auto)
Import-RTs:         65001:102
Export-RTs:         65001:102
Per-EVI Label:     none
State:              Established
Replication Type:   Ingress (global)
Encapsulation:     vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5:  Disabled
Adv. Multicast:     Enabled (global)
Vlan:              102
  Protected:        False
  Ethernet-Tag:     0
  State:            Established
  Flood Suppress:   Attached
Core If:
Access If:
NVE If:            nve1
RMAC:              0000.0000.0000
Core Vlan:         0
L2 VNI:            10102
L3 VNI:            0
VTEP IP:           172.16.254.6
Pseudoports:
  TenGigabitEthernet1/0/11 service instance 102
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 1 IMET, 0 EAD
    
```

Leaf-03# **show l2vpn evpn multicast local address FF06::239:1:1:2EVI** VLAN Interface

Version	Filter	(Source, Group)	
102	102	Tel1/0/11	MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)

Leaf-03# **show l2vpn evpn multicast remote address FF06::239:1:1:2EVI** VLAN Originator

Version	Filter	(Source, Group)	
102	102	172.16.254.4	MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)

Leaf-03# **show l2route evpn multicast routes group FF06::239:1:1:2**

EVI	ETAG	Group	Source
102	0	FF06::239:1:1:2	::
		V:10102 172.16.254.4, V:10102 172.16.254.3, Tel1/0/11:102	

```

Leaf-03# show l2route evpn multicast smet group FF06::239:1:1:2
EVI  ETAG      Origin          Group           Filter
Source(s)
-----
-----
102  0           Tel1/0/11:102   FF06::239:1:1:2  INCLUDE
2001:10:1:102::11
102  0           172.16.254.4    FF06::239:1:1:2  INCLUDE
2001:10:1:102::11

Leaf-03# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 138
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 1
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 7 2022 13:39:42 UTC
Refresh Epoch 1
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 13:39:42 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 140
Paths: (1 available, best #1, table evi_102)
Not advertised to any peer
Refresh Epoch 1
Local, imported path from
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51
(global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 13:39:42 UTC

Leaf-03# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.6BGP
routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 146
Paths: (1 available, best #1, table evi_102)
Advertised to update-groups:
  1
Refresh Epoch 1
Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2

```

```

Extended Community: RT:65001:102 ENCAP:8
Local irb vxlan vtep:
  vrf:not found, l3-vni:0
  local router mac:0000.0000.0000
  core-irb interface:(not found)
  vtep-ip:172.16.254.6
rx pathid: 0, tx pathid: 0x0
Updated on Apr 7 2022 13:41:25 UTC

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic](#), on page 33.

## Outputs to Verify Configuration on Spine Switch 1

### Verify the configuration with MLD exclude.

```

Spine-01# show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 79, main routing table version 79
44 network entries using 16896 bytes of memory
88 path entries using 19712 bytes of memory
11/11 BGP path/bestpath attribute entries using 3256 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
7 BGP extended community entries using 264 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 40248 total bytes of memory
BGP activity 54/10 prefixes, 108/20 paths, scan interval 60 secs
47 networks peaked at 16:07:10 Apr 6 2022 UTC (20:25:33.334 ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.2	4	65001	1423	1428	79	0	0	20:43:17	44
172.16.255.3	4	65001	1384	1431	79	0	0	20:46:03	10
172.16.255.4	4	65001	1400	1449	79	0	0	20:46:02	22
172.16.255.6	4	65001	1389	1428	79	0	0	20:45:54	12

### Verify the configuration with MLD include.

```

Spine-01#sh bgp l2vpn evpn all summ
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 79, main routing table version 79
44 network entries using 16896 bytes of memory
88 path entries using 19712 bytes of memory
11/11 BGP path/bestpath attribute entries using 3256 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
7 BGP extended community entries using 264 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 40248 total bytes of memory
BGP activity 54/10 prefixes, 108/20 paths, scan interval 60 secs
47 networks peaked at 16:07:10 Apr 6 2022 UTC (21:19:08.411 ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.2	4	65001	1482	1487	79	0	0	21:36:52	44
172.16.255.3	4	65001	1443	1491	79	0	0	21:39:38	10
172.16.255.4	4	65001	1458	1508	79	0	0	21:39:37	22
172.16.255.6	4	65001	1447	1487	79	0	0	21:39:30	12

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic, on page 33](#).

## Outputs to Verify Configuration on Spine Switch 2

### Verify the configuration with MLD exclude.

```
Spine-02# show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 79, main routing table version 79
44 network entries using 16896 bytes of memory
88 path entries using 19712 bytes of memory
11/11 BGP path/bestpath attribute entries using 3256 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
7 BGP extended community entries using 264 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 usinory
BGP activity 54/10 prefixes, 108/20 paths, scan interval 60 secs
47 networkg 40248 total bytes of mems peaked at 16:07:00 Apr 6 2022 UTC (20:26:17.324 ago)
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	1429	1424	79	0	0	20:43:51	44
172.16.255.3	4	65001	1384	1429	79	0	0	20:43:47	10
172.16.255.4	4	65001	1401	1446	79	0	0	20:43:45	22
172.16.255.6	4	65001	1385	1427	79	0	0	20:43:48	12

### Verify the configuration with MLD include.

```
Spine-02#show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 79, main routing table version 79
44 network entries using 16896 bytes of memory
88 path entries using 19712 bytes of memory
11/11 BGP path/bestpath attribute entries using 3256 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
7 BGP extended community entries using 264 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 40248 total bytes of memory
BGP activity 54/10 prefixes, 108/20 paths, scan interval 60 secs
47 networks peaked at 16:07:00 Apr 6 2022 UTC (21:19:32.246 ago)
```

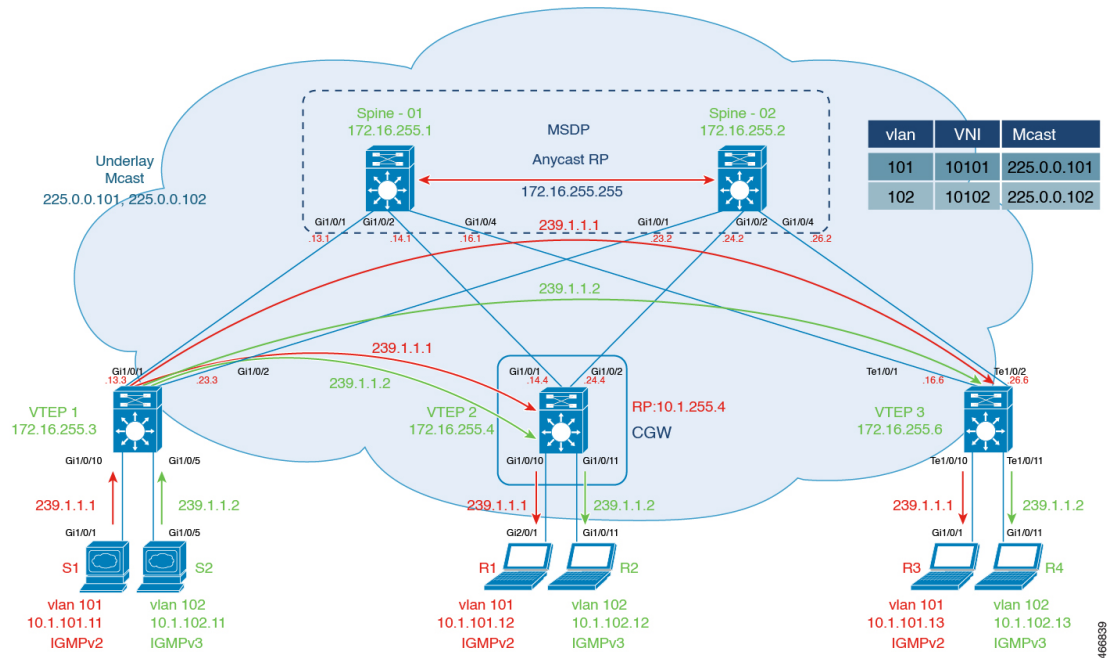
Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	1487	1482	79	0	0	21:37:06	44
172.16.255.3	4	65001	1443	1489	79	0	0	21:37:02	10
172.16.255.4	4	65001	1459	1504	79	0	0	21:37:00	22
172.16.255.6	4	65001	1444	1485	79	0	0	21:37:03	12

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic, on page 33](#).

## Example 3: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication

This example shows how to configure Optimized Layer 2 Multicast for IPv4 multicast traffic across the Layer 2 overlays in an EVPN VXLAN fabric that has underlay multicast replication enabled.

Figure 6: Topology for Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication



The topology shows an EVPN VXLAN network with the source connected to Layer 2 VTEP 1 and a receiver connected to Layer 2 VTEP 3. Centralized Gateway is configured on VTEP 2. The multicast group for VLAN 101 is 225.0.0.101 and for VLAN 102 is 225.0.0.102. The following tables provide sample configurations for the devices in this topology:

Example 3: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication

Table 5: Configure VTEP 1, CGW, and VTEP 3 for Optimized Layer 2 Overlay Multicast for IPv4 Traffic with Underlay Multicast Replication

VTEP 1	CGW	VTEP 3
--------	-----	--------

VTEP 1	CGW	VTEP 3
<pre>Leaf-01#show running-config hostname Leaf-01 ! ip routing ! ip multicast-routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.3 ip igmp snooping querier ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 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 ! 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 GigabitEthernet1/0/5</pre>	<pre>Leaf-02#show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 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 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 ! vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 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 10.1.255.4 255.255.255.255 ip pim sparse-mode ! interface GigabitEthernet1/0/1 no switchport</pre>	<pre>Leaf-03#show running-config hostname Leaf-03 ! ip routing ! ip multicast-routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.6 ip igmp snooping querier ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 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 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</pre>

## Example 3: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication

VTEP 1	CGW	VTEP 3
<pre> switchport access vlan 102 switchport mode access ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 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 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 ! ip pim rp-address 172.16.255.255 ! end </pre>	<pre> 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 GigabitEthernet1/0/11 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 ip igmp version 3 ! 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 </pre>	<pre> ! interface TenGigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface TenGigabitEthernet1/0/11 switchport access vlan 102 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 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 ! address-family ipv4 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 ! ip pim rp-address 172.16.255.255 ! end </pre>



VTEP 1	CGW	VTEP 3
	<pre> 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 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 vrf green rp-address 10.1.255.4 ! end                     </pre>	

Example 3: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication

Table 6: Configure Spine Switch 1 and Spine Switch 2 for Optimized Layer 2 Overlay Multicast for IPv4 Traffic, with Underlay Multicast Replication

Spine Switch 1	Spine Switch 2
----------------	----------------

Spine Switch 1	Spine Switch 2
<pre> Spine-01#show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! 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 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.2 activate </pre>	<pre> Spine-02#show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! 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 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.1 activate </pre>

Spine Switch 1	Spine Switch 2
<pre>neighbor 172.16.255.2 send-community both 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 ! 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</pre>	<pre>neighbor 172.16.255.1 send-community both 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 ! 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</pre>

To return, click [Configuration Example for Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication](#)

To return to the Configuration Examples section, click [Configuration Examples for Optimized Layer 2 Overlay Multicast, on page 10.](#)

## Verifying Optimized Layer 2 Overlay Multicast with Default MDT in the Underlay

The following sections provide sample output of the **show** commands to verify the configuration of Optimized Layer 2 Overlay Multicast with default MDT on the devices in the [Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication.](#)

[Outputs to Verify Configuration on VTEP 1](#)

[Outputs to Verify Configuration on CGW](#)

[Outputs to Verify Configuration on VTEP 3](#)

### Outputs to Verify Configuration on VTEP 1

```
Leaf-01#show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
Neighbor      Interface      Uptime/Expires   Ver   DR
Address
172.16.13.1   GigabitEthernet1/0/1   00:16:02/00:01:28 v2    1 / S P G
172.16.23.2   GigabitEthernet1/0/2   00:16:02/00:01:26 v2    1 / S P G
```

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

```
Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
```

```
Leaf-01#show ip mroute 225.0.0.101
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                        t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 225.0.0.101), 00:15:58/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-Dense, 00:15:58/00:02:03, flags:

(172.16.254.3, 225.0.0.101), 00:11:19/00:02:10, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:11:19/00:03:01, flags:
```

```
Leaf-01#show l2vpn evpn default-gateway vlan 101Valid Default Gateway Address
-----
EVI   VLAN  MAC Address      Source
-----
Y     10.1.101.1          101 101 7c21.0dbd.9541 172.16.254.4
```

```
Leaf-01#show ip igmp snooping querier vlan 101
IP address      : 172.16.254.3
IGMP version    : v3
Port            : Switch
Max response time : 10s
Query interval  : 60s
Robustness variable : 2
```

```
Leaf-01#show ip igmp snooping groups vlan 101
Vlan  Group          Type      Version  Port List
-----
101   239.1.1.1        igmp     v2       Tu0
```

```
Leaf-01#show l2vpn evpn evi 101 detail
EVPN instance: 101 (VLAN Based)
RD: 172.16.254.3:101 (auto)
Import-RTs: 65001:101
Export-RTs: 65001:101
Per-EVI Label: none
State: Established
Replication Type: Static (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5: Disabled
```

```

Adv. Multicast:    Enabled (global)
Vlan:             101
  Protected:      False
  Ethernet-Tag:   0
  State:          Established
  Flood Suppress: Attached
  Core If:
  Access If:
  NVE If:         nve1
  RMAC:           0000.0000.0000
  Core Vlan:      0
  L2 VNI:         10101
  L3 VNI:         0
  VTEP IP:        172.16.254.3
  MCAST IP:       225.0.0.101
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 0 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 1 MAC/IP, 0 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 0 MAC/IP, 0 IMET, 0 EAD

```

```

Leaf-01#show l2vpn evpn multicast local address 239.1.1.1EVI  VLAN  Interface      Version
Filter (Source, Group)
-----

```

```

Leaf-01#show l2vpn evpn multicast remote address 239.1.1.1EVI  VLAN  Originator
Version  Filter (Source, Group)
-----
101  101  172.16.254.4      IGMPv2  N/A      (*, 239.1.1.1)
101  101  172.16.254.6      IGMPv2  N/A      (*, 239.1.1.1)

```

```

Leaf-01# show l2route evpn multicast routes group 239.1.1.1EVI  ETAG      Group
Source      Next-hop(s)
-----

```

```

Leaf-01# show l2route evpn multicast smet group 239.1.1.1
EVI  ETAG      Origin      Group      Filter      Source(s)
-----
101  0         172.16.254.4  239.1.1.1  N/A        (*) IGMPv2
101  0         172.16.254.6  239.1.1.1  N/A        (*) IGMPv2

```

```

Leaf-01#show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.4
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 31
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from [6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23
(global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    IGMP/MLD v2
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.4, Cluster list: 172.16.255.1
    rx pathid: 0, tx pathid: 0x0
    Updated on Apr 5 2022 19:57:09 UTC

```

```

BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 11
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 5 2022 19:57:09 UTC
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 5 2022 19:57:09 UTC

```

```

Leaf-01#show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.6 BGP routing table entry
for [6][172.16.254.3:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 65
Paths: (1 available, best #1, table evi_101)
Flag: 0x100
Not advertised to any peer
Refresh Epoch 2
Local, imported path from [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23
(global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 5 2022 20:07:46 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 57
Paths: (2 available, best #2, table EVPN-BGP-Table)
Flag: 0x100
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 5 2022 20:07:46 UTC
Refresh Epoch 2
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 5 2022 20:07:46 UTC

```

To return, click [Verifying Optimized Layer 2 Multicast with Default MDT in the Underlay](#) .

## Outputs to Verify Configuration on CGW

Leaf-02#show ip pim neighbor

```
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
Neighbor      Interface      Uptime/Expires  Ver  DR
Address
172.16.14.1   GigabitEthernet1/0/1  00:21:12/00:01:43 v2   1 / S P G
172.16.24.2   GigabitEthernet1/0/2  00:21:11/00:01:40 v2   1 / S P G
```

Leaf-02#show ip pim rp mapping

```
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
```

Leaf-02#show ip mroute 225.0.0.101

```
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,
       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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                          t - LISP transit group
```

Timers: Uptime/Expires

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

(\*, 225.0.0.101), 00:21:16/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-Dense, 00:21:16/00:02:45, flags:

(172.16.254.3, 225.0.0.101), 00:15:36/00:01:15, flags: JTx

Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2

Outgoing interface list:

Tunnel0, Forward/Sparse-Dense, 00:15:36/00:02:23, flags:

Leaf-02#show l2vpn evpn default-gateway vlan 101

```
Valid Default Gateway Address      EVI  VLAN  MAC Address  Source
-----
Y  10.1.101.1                       101  101   7c21.0dbd.9541 V1101
```

Leaf-02#show ip igmp snooping querier vlan 101

```
IP address      : 10.1.101.1
IGMP version    : v2
Port            : Router
Max response time : 10s
```



```
Leaf-02#show ip igmp snooping groups vlan 101
-----
Version      Port List
-----
101          239.1.1.1          igmp          v2          Gi1/0/10, Tu0
```

```
Leaf-02#show l2vpn evpn evi 101 detail
EVPN instance:          101 (VLAN Based)
RD:                     172.16.254.4:101 (auto)
Import-RTs:             65001:101
Export-RTs:              65001:101
Per-EVI Label:          none
State:                   Established
Replication Type:        Static (global)
Encapsulation:           vxlan
IP Local Learn:          Enabled (global)
Adv. Def. Gateway:       Enabled (global)
Re-originate RT5:        Disabled
Adv. Multicast:          Enabled (global)
Vlan:                    101
  Protected:              False
  Ethernet-Tag:           0
  State:                   Established
  Flood Suppress:         Attached
  Core If:                 Vlan901
  Access If:               Vlan101
  NVE If:                  nve1
  RMAC:                     7c21.0dbd.9548
  Core Vlan:                901
  L2 VNI:                  10101
  L3 VNI:                  50901
  VTEP IP:                 172.16.254.4
  MCAST IP:                225.0.0.101
  VRF:                      green
  IPv4 IRB:                 Enabled
  IPv6 IRB:                 Disabled
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 0 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 0 MAC/IP, 0 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 0 MAC/IP, 0 IMET, 0 EAD
```

```
Leaf-02#show l2vpn evpn multicast local address 239.1.1.1
-----
EVI  VLAN  Interface      Version  Filter  (Source, Group)
-----
101  101    Gi1/0/10        IGMPv2   N/A     (*, 239.1.1.1)
```

```
Leaf-02#show l2vpn evpn multicast remote address 239.1.1.1
-----
EVI  VLAN  Originator
Version  Filter  (Source, Group)
-----
101  101    172.16.254.6    IGMPv2   N/A     (*, 239.1.1.1)
```

```
Leaf-02#show l2route evpn multicast routes group 239.1.1.1
-----
EVI  ETAG    Group          Source      Next-hop(s)
-----
101  0       239.1.1.1     *           Gi1/0/10:101, V:10101 225.0.0.101
```

```
Leaf-02#show l2route evpn multicast smet group 239.1.1.1
```

EVI	ETAG	Origin	Group	Filter	Source(s)
101	0	Gi1/0/10:101	239.1.1.1	N/A	(*) IGMPv2
101	0	172.16.254.6	239.1.1.1	N/A	(*) IGMPv2

Leaf-02#**show bgp l2vpn evpn route-type 6 0 \* 239.1.1.1 172.16.254.4**

```
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 12
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.4)
    Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
    IGMP/MLD v2
    Extended Community: RT:65001:101 ENCAP:8
    Local irb vxlan vtep:
      vrf:green, 13-vni:50901
      local router mac:7C21.0DBD.9548
      core-irb interface:Vlan901
      vtep-ip:172.16.254.4
    rx pathid: 0, tx pathid: 0x0
    Updated on Apr 5 2022 19:56:23 UTC
```

Leaf-02#**show bgp l2vpn evpn route-type 6 0 \* 239.1.1.1 172.16.254.6**

```
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 62
Paths: (1 available, best #1, table evi_101)
  Flag: 0x100
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23
  (global)
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 5 2022 20:07:46 UTC
  BGP routing table entry for
  [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 54
  Paths: (2 available, best #2, table EVPN-BGP-Table)
    Flag: 0x100
    Not advertised to any peer
    Refresh Epoch 2
    Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 5 2022 20:07:46 UTC
    Refresh Epoch 2
    Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
```

```
rx pathid: 0, tx pathid: 0x0
Updated on Apr 5 2022 20:07:46 UTC
```

```
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                          t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 00:20:45/00:02:16, RP 10.1.255.4, flags: SJC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:20:45/00:02:16, flags:

(*, 239.1.1.2), 00:20:45/00:02:16, RP 10.1.255.4, flags: SJC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:20:45/00:02:16, flags:

(*, 224.0.1.40), 00:21:54/00:02:05, RP 10.1.255.4, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback255, Forward/Sparse, 00:21:53/00:02:05, flags:
```

To return, click [Verifying Optimized Layer 2 Multicast with Default MDT in the Underlay](#) .

### Outputs to Verify Configuration on VTEP 3

```
Leaf-03#show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
Neighbor          Interface                Uptime/Expires    Ver  DR
Address
172.16.16.1       TenGigabitEthernet1/0/1  00:12:30/00:01:34 v2   1 / S P G
172.16.26.2       TenGigabitEthernet1/0/2  00:12:29/00:01:33 v2   1 / S P G

Leaf-03#show ip pim rp mappingPIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)
```

```

Leaf-03#show ip mroute 225.0.0.101IP 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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                        t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 225.0.0.101), 00:12:43/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-Dense, 00:12:36/00:02:23, flags:

(172.16.254.3, 225.0.0.101), 00:12:27/00:02:46, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse-Dense, 00:12:27/00:02:32, flags:

```

```

Leaf-03#show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address      EVI   VLAN  MAC Address      Source
-----
Y  10.1.101.1                      101   101   7c21.0dbd.9541  172.16.254.4

```

```

Leaf-03#show ip igmp snooping querier vlan 101
IP address       : 172.16.254.6
IGMP version     : v3
Port             : Switch
Max response time : 10s
Query interval   : 60s
Robustness variable : 2

```

```

Leaf-03#show ip igmp snooping groups vlan 101Vlan      Group      Type
Version      Port List
-----
101          239.1.1.1          igmp        v2          Te1/0/10, Tu0

```

```

Leaf-03#show l2vpn evpn evi 101 detailEVPN instance:      101 (VLAN Based)
RD:           172.16.254.6:101 (auto)
Import-RTs:   65001:101
Export-RTs:   65001:101
Per-EVI Label: none
State:        Established
Replication Type: Static (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Enabled (global)

```

```

Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 101
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
Core If:
Access If:
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10101
L3 VNI: 0
VTEP IP: 172.16.254.6
MCAST IP: 225.0.0.101
Pseudoports:
  TenGigabitEthernet1/0/10 service instance 101
  Routes: 1 MAC, 0 MAC/IP
Peers:
  172.16.254.3
  Routes: 1 MAC, 0 MAC/IP, 0 IMET, 0 EAD
  172.16.254.4
  Routes: 2 MAC, 1 MAC/IP, 0 IMET, 0 EAD

```

```

Leaf-03#show l2vpn evpn multicast local address 239.1.1.1
EVI  VLAN  Interface      Version  Filter  (Source, Group)
-----
101  101    Te1/0/10      IGMPv2   N/A     (*, 239.1.1.1)

```

```

Leaf-03#show l2vpn evpn multicast remote address 239.1.1.1EVI  VLAN  Originator
Version  Filter  (Source, Group)
-----
101  101    172.16.254.4  IGMPv2   N/A     (*, 239.1.1.1)

```

```

Leaf-03#show l2route evpn multicast routes group 239.1.1.1
EVI  ETAG    Group          Source      Next-hop(s)
-----
101  0       239.1.1.1     *           Te1/0/10:101, V:10101 225.0.0.101

```

```

Leaf-03#show l2route evpn multicast smet group 239.1.1.1EVI  ETAG    Origin
Group      Filter      Source(s)
-----
101  0       Te1/0/10:101  239.1.1.1  N/A     (*) IGMPv2
101  0       172.16.254.4  239.1.1.1  N/A     (*) IGMPv2

```

```

Leaf-03#show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.4BGP routing table entry
for [6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 11
Paths: (2 available, best #1, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 5 2022 20:06:53 UTC

```

#### Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication

```

Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 5 2022 20:06:52 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 23
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from [6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23
(global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 5 2022 20:07:46 UTC

Leaf-03#show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.6
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 14
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
  1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Local irb vxlan vtep:
  vrf:not found, l3-vni:0
  local router mac:0000.0000.0000
  core-irb interface:(not found)
  vtep-ip:172.16.254.6
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 5 2022 20:07:19 UTC

```

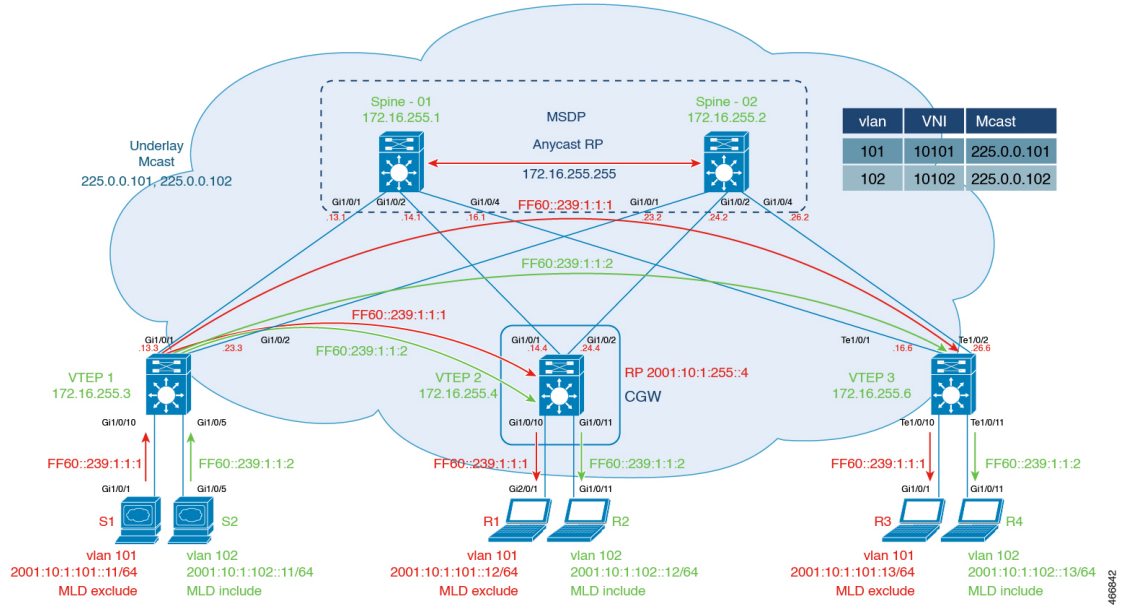
To return, click [Verifying Optimized Layer 2 Overlay Multicast with Default MDT in the Underlay](#) .

## Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication

This example shows how to configure Optimized Layer 2 Multicast for IPv4 and IPv6 multicast traffic across the Layer 2 overlays in an EVPN VXLAN fabric that has underlay multicast replication.

For IPv4 multicast traffic, refer [Figure 6: Topology for Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication](#).

Figure 7: Topology for Optimized Layer 2 Overlay Multicast for IPv6 with Underlay Multicast Replication



The topology shows an EVPN VXLAN network with the source connected to Layer 2 VTEP 1 and receivers connected to Layer 2 VTEP 3. A Centralized Gateway is configured on VTEP 2. The multicast group for VLAN 101 is 225.0.0.101 and for VLAN 102 is 225.0.0.102. The following tables provide sample configurations for the devices in this topology:

Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication

Table 7: Configure VTEP 1, CGW, and VTEP 3 for Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 Traffic, with Underlay Multicast Replication

VTEP 1	CGW	VTEP 3
--------	-----	--------



VTEP 1	CGW	VTEP 3
<pre>Leaf-01#show running-config  hostname Leaf-01 ! ip routing ip multicast-routing !  ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.3 ip igmp snooping querier !  ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping !  l2vpn evpn replication-type static router-id Loopback1 multicast advertise !  l2vpn evpn instance 101 vlan-based encapsulation vxlan !  l2vpn evpn instance 102 vlan-based encapsulation vxlan !  vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 !  interface Loopback0 ip address 172.16.255.3 255.255.255.255 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 !  interface GigabitEthernet1/0/2 no switchport</pre>	<pre>Leaf-02#show running-config  hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 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 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 ! ipv6 unicast-routing ipv6 mld snooping ipv6 multicast-routing vrf green !  l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise multicast advertise !  l2vpn evpn instance 101 vlan-based encapsulation vxlan !  l2vpn evpn instance 102 vlan-based encapsulation vxlan !  vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 !  interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip ospf 1 area 0 !  interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode</pre>	<pre>Leaf-03#show running-config  hostname Leaf-03 ! ip routing ip multicast-routing !  ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.6 ip igmp snooping querier !  ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping !  l2vpn evpn replication-type static router-id Loopback1 multicast advertise !  l2vpn evpn instance 101 vlan-based encapsulation vxlan !  l2vpn evpn instance 102 vlan-based encapsulation vxlan !  vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 !  interface Loopback0 ip address 172.16.255.6 255.255.255.255 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 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</pre>

## Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication

VTEP 1	CGW	VTEP 3
<pre> 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 GigabitEthernet1/0/5 switchport access vlan 102 switchport mode access ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 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 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 ! ip pim rp-address 172.16.255.255 ! end </pre>	<pre> ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.1.255.4 255.255.255.255 ip pim sparse-mode ipv6 address 2001:10:1:255::4/128 ! 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 GigabitEthernet1/0/11 switchport access vlan 102 switchport mode access spanning-tree portfast ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ipv6 address 2001:10:1:101::1/64 ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ipv6 address 2001:10:1:102::1/64 ! interface Vlan901 no ip address ipv6 enable ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 10102 mcast-group </pre>	<pre> 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 101 switchport mode access ! interface TenGigabitEthernet1/0/11 switchport access vlan 102 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 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 ! address-family ipv4 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 ! ip pim rp-addr 172.16.255.255 ! end </pre>

VTEP 1	CGW	VTEP 3
	<pre> 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 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 static redistribute connected 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 10.1.255.4 ipv6 pim vrf green rp-address 2001:10:1:255::4 ! end                 </pre>	

Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication

Table 8: Configure Spine Switch 1 and Spine Switch 2 for Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication

Spine Switch 1	Spine Switch 2
----------------	----------------

Spine Switch 1	Spine Switch 2
<pre> Spine-01#show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! 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 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.2 activate </pre>	<pre> Spine-02#show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! 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 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 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 ! address-family l2vpn evpn neighbor 172.16.255.1 activate </pre>

Spine Switch 1	Spine Switch 2
<pre>neighbor 172.16.255.2 send-community both 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 ! 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</pre>	<pre>neighbor 172.16.255.1 send-community both 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 ! 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</pre>

To return, click [Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication](#).

To return to the Configuration Examples section, click [Configuration Examples for Optimized Layer 2 Overlay Multicast](#), on page 10

## Verifying Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 Traffic

The following sections provide sample output of the **show** commands to verify Optimized Layer 2 Overlay Multicast with default MDT for IPv4 and IPv6 multicast traffic on the devices in the [Example 4: Configuring Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 with Underlay Multicast Replication](#).

To see the output of the **show** commands for IPv4 multicast traffic, go to [Verifying Optimized Layer 2 Overlay Multicast with Default MDT in the Underlay](#), on page 60.

The outputs of the **show** commands for IPv6 multicast traffic are provided in the following: sections.

[Outputs to Verify Configuration on VTEP 1](#)

[Outputs to Verify Configuration on CGW](#)

[Outputs to verify configuration on VTEP 3](#)

[Outputs to verify configuration on Spine Switch 1](#)

[Outputs to verify configuration on Spine Switch 2](#)

### Outputs to Verify Configuration on VTEP 1

Verify the configuration with MLD exclude.

```
Leaf-01# show ip pim neighborPIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
Neighbor      Interface                Uptime/Expires    Ver   DR
Address
172.16.13.1   GigabitEthernet1/0/1    1d00h/00:01:19   v2    1 / S P G
```

```
172.16.23.2      GigabitEthernet1/0/2      1d00h/00:01:34      v2      1 / S P G
```

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

```
Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)
```

```
Leaf-01# show ip mroute 225.0.0.101
```

```
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
```

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

(*, 225.0.0.101), 1d00h/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-Dense, 1d00h/00:01:44, flags:

(172.16.254.6, 225.0.0.101), 1d00h/00:01:27, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:17, flags:

(172.16.254.4, 225.0.0.101), 1d00h/00:01:11, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:47, flags:

(172.16.254.3, 225.0.0.101), 1d00h/00:02:58, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:11, flags:
```

```
Leaf-01# show l2vpn evpn default-gateway vlan 101 Valid Default Gateway Address
```

EVI	VLAN	MAC Address	Source
Y	10.1.101.1		101 101 7c21.0dbd.9541 172.16.254.4
Y	2001:10:1:101::1		101 101 7c21.0dbd.9541 172.16.254.4

```
Leaf-01#show ipv6 mld snooping querier vlan 101
IP address      : FE80:0:2A56:0:12B3:D5FF:FE6A:8F80
MLD version    : v2
Port           : Switch
Max response time : 10s
Query interval  : 125s
```

Robustness variable : 2

Leaf-01# **show ipv6 mld snooping membership vlan 101**  
Snooping Membership Summary for Vlan 101

-----  
Total number of channels: 1  
Total number of hosts : 2

Source/Group Last-Join/	Interface	Reporter	Vlan	Uptime	Last-Leave
::/FF06::239:1:1:1 1d00h /	Tu0	FE80::AC10:FE04	101	1d00h	-
::/FF06::239:1:1:1 1d00h /	Tu0	FE80::AC10:FE06	101	1d00h	-

Leaf-01# **show l2vpn evpn evi 101 detail**

```

EVPN instance: 101 (VLAN Based)
RD: 172.16.254.3:101 (auto)
Import-RTs: 65001:101
Export-RTs: 65001:101
Per-EVI Label: none
State: Established
Replication Type: Static (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 101
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
Core If:
Access If:
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10101
L3 VNI: 0
VTEP IP: 172.16.254.3
MCAST IP: 225.0.0.101
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 3 MAC/IP, 0 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD

```

Leaf-01# **show l2vpn evpn multicast local address FF06::239:1:1:1**  
EVI VLAN Interface Version Filter (Source, Group)



```

-----
Leaf-01# show l2vpn evpn multicast remote address FF06::239:1:1:1
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----
101  101    172.16.254.4         MLDv2   EXCLUDE (*, FF06::239:1:1:1)
101  101    172.16.254.6         MLDv2   EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-01# show l2route evpn multicast routes group FF06::239:1:1:1
EVI  ETAG      Group              Source
      Next-hop(s)
-----

```

```

Leaf-01#show l2route evpn multicast smet group FF06::239:1:1:1
EVI  ETAG      Origin              Group              Filter
Source(s)
-----
101  0          172.16.254.4       FF06::239:1:1:1   EXCLUDE
(*)MLDv2
101  0          172.16.254.6       FF06::239:1:1:1   EXCLUDE
(*)MLDv2

```

```

Leaf-01# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4BGP routing table
entry for [6][172.16.254.3:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version
42

```

```

Paths: (1 available, best #1, table evi_101)

```

```

Flag: 0x100

```

```

Not advertised to any peer

```

```

Refresh Epoch 1

```

```

Local, imported path from

```

```

[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35 (global)

```

```

172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)

```

```

Origin incomplete, metric 0, localpref 100, valid, internal, best

```

```

IGMP/MLD v2, exclude

```

```

Extended Community: RT:65001:101 ENCAP:8

```

```

Originator: 172.16.255.4, Cluster list: 172.16.255.1

```

```

rx pathid: 0, tx pathid: 0x0

```

```

Updated on Apr 7 2022 14:38:47 UTC

```

```

BGP routing table entry for

```

```

[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 25

```

```

Paths: (2 available, best #2, table EVPN-BGP-Table)

```

```

Flag: 0x100

```

```

Not advertised to any peer

```

```

Refresh Epoch 1

```

```

Local

```

```

172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)

```

```

Origin incomplete, metric 0, localpref 100, valid, internal

```

```

IGMP/MLD v2, exclude

```

```

Extended Community: RT:65001:101 ENCAP:8

```

```

Originator: 172.16.255.4, Cluster list: 172.16.255.2

```

```

rx pathid: 0, tx pathid: 0

```

```

Updated on Apr 7 2022 14:39:04 UTC

```

```

Refresh Epoch 1

```

```

Local

```

```

172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)

```

```

Origin incomplete, metric 0, localpref 100, valid, internal, best

```

```

IGMP/MLD v2, exclude

```

```

Extended Community: RT:65001:101 ENCAP:8

```

```

Originator: 172.16.255.4, Cluster list: 172.16.255.1

```

```
rx pathid: 0, tx pathid: 0x0
Updated on Apr 7 2022 14:38:47 UTC
```

```
Leaf-01# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6 BGP routing table
entry for [6][172.16.254.3:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version
20
```

```
Paths: (1 available, best #1, table evi_101)
```

```
Not advertised to any peer
```

```
Refresh Epoch 1
```

```
Local, imported path from
```

```
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35 (global)
```

```
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best
```

```
IGMP/MLD v2, exclude
```

```
Extended Community: RT:65001:101 ENCAP:8
```

```
Originator: 172.16.255.6, Cluster list: 172.16.255.1
```

```
rx pathid: 0, tx pathid: 0x0
```

```
Updated on Apr 7 2022 14:38:41 UTC
```

```
BGP routing table entry for
```

```
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 13
```

```
Paths: (2 available, best #2, table EVPN-BGP-Table)
```

```
Not advertised to any peer
```

```
Refresh Epoch 1
```

```
Local
```

```
172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal
```

```
IGMP/MLD v2, exclude
```

```
Extended Community: RT:65001:101 ENCAP:8
```

```
Originator: 172.16.255.6, Cluster list: 172.16.255.2
```

```
rx pathid: 0, tx pathid: 0
```

```
Updated on Apr 7 2022 14:39:04 UTC
```

```
Refresh Epoch 1
```

```
Local
```

```
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best
```

```
IGMP/MLD v2, exclude
```

```
Extended Community: RT:65001:101 ENCAP:8
```

```
Originator: 172.16.255.6, Cluster list: 172.16.255.1
```

```
rx pathid: 0, tx pathid: 0x0
```

```
Updated on Apr 7 2022 14:38:41 UTC
```

### Verify the configuration with MLD include.

```
Leaf-01# show ip pim neighbor PIM Neighbor Table
```

```
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
```

```
P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
```

```
L - DR Load-balancing Capable
```

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
172.16.13.1	GigabitEthernet1/0/1	1d00h/00:01:34	v2	1 / S P G
172.16.23.2	GigabitEthernet1/0/2	1d00h/00:01:20	v2	1 / S P G

```
Leaf-01# show ip pim rp mapping
```

```
PIM Group-to-RP Mappings
```

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

```
RP: 172.16.255.255 (?)
```

```
Leaf-01# show ip mroute 225.0.0.102
```

```
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, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join  
 t - LISP transit group

Timers: Uptime/Expires

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

```
(*, 225.0.0.102), 1d00h/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-Dense, 1d00h/00:02:08, flags:

(172.16.254.6, 225.0.0.102), 1d00h/00:01:51, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:54, flags:

(172.16.254.4, 225.0.0.102), 1d00h/00:01:43, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse-Dense, 1d00h/00:00:09, flags:

(172.16.254.3, 225.0.0.102), 1d00h/00:01:56, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:06, flags:
```

Leaf-01# **show l2vpn evpn default-gateway vlan 102**

Valid	Default Gateway Address	EVI	VLAN	MAC Address	Source
Y	10.1.102.1	102	102	7c21.0dbd.954d	172.16.254.4
Y	2001:10:1:102::1	102	102	7c21.0dbd.954d	172.16.254.4

Leaf-01# **show ipv6 mld snooping querier vlan 102**

```
IP address      : FE80:0:2A56:0:12B3:D5FF:FE6A:8F80
MLD version    : v2
Port           : Switch
Max response time : 10s
Query interval  : 125s
Robustness variable : 2
```

Leaf-01# **show ipv6 mld snooping membership vlan 102 source 2001:10:1:102::11 group FF06::239:1:1:2**

Source/Group	Interface	Reporter	Vlan	Uptime	Last-Leave
2001:10:1:102::11/FF06::239:1:1:2 \	Tu0	FE80::AC10:FE04	102	1d00h	

```

1d00h      /
-

2001:10:1:102::11/FF06::239:1:1:2 \
Tu0        FE80::AC10:FE06          102 1d00h
1d00h      /
-

```

Leaf-01# **show l2vpn evpn evi 102 detail**

```

EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.3:102 (auto)
Import-RTs:        65001:102
Export-RTs:        65001:102
Per-EVI Label:     none
State:              Established
Replication Type:  Static (global)
Encapsulation:     vxlan
IP Local Learn:    Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast:    Enabled (global)
Vlan:              102
  Protected:       False
  Ethernet-Tag:    0
  State:           Established
  Flood Suppress:  Attached
Core If:
Access If:
NVE If:            nve1
RMAC:              0000.0000.0000
Core Vlan:         0
L2 VNI:            10102
L3 VNI:            0
VTEP IP:           172.16.254.3
MCAST IP:          225.0.0.102
Pseudoports:
  GigabitEthernet1/0/5 service instance 102
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 0 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD

```

Leaf-01# **show l2vpn evpn multicast local address FF06::239:1:1:2EVI** VLAN Interface  
Version Filter (Source, Group)

Leaf-01# **show l2vpn evpn multicast remote address FF06::239:1:1:2**

EVI	VLAN	Originator	Version	Filter	(Source, Group)
102	102	172.16.254.4	MLDv2	INCLUDE	(2001:10:1:102::11, FF06::239:1:1:2)
102	102	172.16.254.6	MLDv2	INCLUDE	(2001:10:1:102::11, FF06::239:1:1:2)

Leaf-01# **show l2route evpn multicast routes group FF06::239:1:1:2EVI** ETAG Group  
Source Next-hop(s)

```

-----
-----

```

```

Leaf-01# show l2route evpn multicast smet group FF06::239:1:1:2EVI ETAG Origin
          Group                               Filter      Source(s)
-----
-----
102  0          172.16.254.4          FF06::239:1:1:2          INCLUDE
2001:10:1:102::11
102  0          172.16.254.6          FF06::239:1:1:2          INCLUDE
2001:10:1:102::11

Leaf-01# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.4
BGP routing table entry for
[6][172.16.254.3:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 44
Paths: (1 available, best #1, table evi_102)
  Flag: 0x100
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51
(global)
    172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 7 2022 14:38:47 UTC
BGP routing table entry for
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 31
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Flag: 0x100
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 7 2022 14:39:04 UTC
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 7 2022 14:38:47 UTC

Leaf-01#show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.6
BGP routing table entry for
[6][172.16.254.3:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 22
Paths: (1 available, best #1, table evi_102)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51
(global)

```

```

172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:38:41 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 15
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on Apr 7 2022 14:39:04 UTC
    Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:102 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Apr 7 2022 14:38:41 UTC

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 Traffic, on page 78](#).

## Outputs to Verify Configuration on CGW

### Verify the configuration with MLD exclude.

```

Leaf-02#show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
Neighbor      Interface      Uptime/Expires   Ver   DR
Address
172.16.14.1   GigabitEthernet1/0/1   1d00h/00:01:39   v2    1 / S P G
172.16.24.2   GigabitEthernet1/0/2   1d00h/00:01:30   v2    1 / S P G

```

```

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

```

```

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)

```

```

Leaf-02# show ip mroute 225.0.0.101IP 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, l - LISP decap ref count contributor  
 Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join  
 t - LISP transit group

Timers: Uptime/Expires

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

```
(*, 225.0.0.101), 1d00h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel2, Forward/Sparse-Dense, 1d00h/00:00:12, flags:

(172.16.254.6, 225.0.0.101), 1d00h/00:01:08, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel2, Forward/Sparse-Dense, 1d00h/00:00:39, flags:

(172.16.254.3, 225.0.0.101), 1d00h/00:01:02, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel2, Forward/Sparse-Dense, 1d00h/00:01:12, flags:

(172.16.254.4, 225.0.0.101), 1d00h/00:02:57, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:15, flags:
```

Leaf-02# **show l2vpn evpn default-gateway vlan 101**

Valid	Default Gateway Address	EVI	VLAN	MAC Address	Source
Y	10.1.101.1	101	101	7c21.0dbd.9541	Vl101
Y	2001:10:1:101::1	101	101	7c21.0dbd.9541	Vl101

Leaf-02# **show ipv6 mld snooping querier vlan 101**

```
IP address      : FE80::46D3:CAFF:FE28:6CC1
MLD version    : v2
Port           : Gi1/0/10
Max response time : 10s
Query interval  : 125s
Robustness variable : 2
```

Leaf-02# **show ipv6 mld snooping membership vlan 101**

Snooping Membership Summary for Vlan 101

```
-----
Total number of channels: 1
Total number of hosts   : 2
```

Source/Group	Interface	Reporter	Vlan	Uptime	Last-Leave
::/FF06::239:1:1:1	Gi1/0/10	FE80::46D3:CAFF:FE28:6CC1	101	00:00:00	
00:00:01 /					00:00:01

```

::/FF06::239:1:1:1          Tu2          FE80::AC10:FE06          101  1d00h
1d00h      /

```

Leaf-02# **show l2vpn evpn evi 101 detail**

```

EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.4:101 (auto)
Import-RTs:        65001:101
Export-RTs:        65001:101
Per-EVI Label:     none
State:              Established
Replication Type:   Static (global)
Encapsulation:     vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5:  Disabled
Adv. Multicast:     Enabled (global)
Vlan:              101
  Protected:        False
  Ethernet-Tag:     0
  State:            Established
  Flood Suppress:   Attached
  Core If:
  Access If:        Vlan101
  NVE If:           nve1
  RMAC:             0000.0000.0000
  Core Vlan:        0
  L2 VNI:           10101
  L3 VNI:           0
  VTEP IP:          172.16.254.4
  MCAST IP:         225.0.0.101
  VRF:
  IPv4 IRB:         Enabled (Asymmetric)
  IPv6 IRB:         Enabled (Asymmetric)
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 1 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD

```

```

Leaf-02# show l2vpn evpn multicast local address FF06::239:1:1:1EVI  VLAN  Interface
Version  Filter  (Source, Group)
-----
101     101     Gi1/0/10          MLDv2      EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-02# show l2vpn evpn multicast remote address FF06::239:1:1:1EVI  VLAN  Originator
Version  Filter  (Source, Group)
-----
101     101     172.16.254.6     MLDv2      EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-02# show l2route evpn multicast routes group FF06::239:1:1:1
EVI  ETAG  Group          Source
-----
Next-hop(s)
-----
101  0     FF06::239:1:1:1  ::

```



```
Gi1/0/10:101, V:10101 225.0.0.101
```

```
Leaf-02# show l2route evpn multicast smet group FF06::239:1:1:1
EVI  ETAG      Origin          Group           Filter
Source(s)
-----
101  0           Gi1/0/10:101   FF06::239:1:1:1  EXCLUDE
(*)MLDv2
101  0           172.16.254.6   FF06::239:1:1:1  EXCLUDE
(*)MLDv2
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 26
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
    :: (via default) from 0.0.0.0 (172.16.255.4)
    Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Local irb vxlan vtep:
      vrf:not found, l3-vni:0
      local router mac:0000.0000.0000
      core-irb interface:(not found)
      vtep-ip:172.16.254.4
    rx pathid: 0, tx pathid: 0x0
    Updated on Apr 7 2022 14:37:21 UTC
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6BGP routing table
entry for [6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version
44
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35 (global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:38:47 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 30
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
    Origin incomplete, metric 0, localpref 100, valid, internal
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.6, Cluster list: 172.16.255.2
    rx pathid: 0, tx pathid: 0
    Updated on Apr 7 2022 14:39:04 UTC
  Refresh Epoch 1
  Local
```

```

172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v2, exclude
Extended Community: RT:65001:101 ENCAP:8
Originator: 172.16.255.6, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on Apr 7 2022 14:38:41 UTC

```

```

Leaf-02# show ipv6 mroute vrf green FF06::239:1:1:1Multicast 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::239:1:1:1), 1d00h/never, RP 2001:10:1:255::4, flags: SCJ
Incoming interface: Tunnel5
RPF nbr: 2001:10:1:255::4
Immediate Outgoing interface list:
Vlan101, Forward, 1d00h/never

```

### Verify the configuration with MLD include.

```

Leaf-02# show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
L - DR Load-balancing Capable
Neighbor          Interface                Uptime/Expires    Ver   DR
Address
172.16.14.1       GigabitEthernet1/0/1     1d00h/00:01:26    v2    1 / S P G
172.16.24.2       GigabitEthernet1/0/2     1d00h/00:01:17    v2    1 / S P G

```

```

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

```

```

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)

```

```

Leaf-02# show ip mroute 225.0.0.102
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                        t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 225.0.0.102), 1d00h/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel2, Forward/Sparse-Dense, 1d00h/00:01:02, flags:

(172.16.254.6, 225.0.0.102), 1d00h/00:01:38, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel2, Forward/Sparse-Dense, 1d00h/00:01:43, flags:

(172.16.254.3, 225.0.0.102), 1d00h/00:01:01, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel2, Forward/Sparse-Dense, 1d00h/00:02:18, flags:

(172.16.254.4, 225.0.0.102), 1d00h/00:02:07, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:06, flags:
    
```

Leaf-02# **show l2vpn evpn default-gateway vlan 102**Valid Default Gateway Address

EVI	VLAN	MAC Address	Source
Y	10.1.102.1		102 102 7c21.0dbd.954d V1102
Y	2001:10:1:102::1		102 102 7c21.0dbd.954d V1102

Leaf-02# **show ipv6 mld snooping querier vlan 102**IP address :

```

FE80::46D3:CAFF:FE28:6CC2
MLD version      : v2
Port              : Gi1/0/11
Max response time : 10s
Query interval    : 125s
Robustness variable : 2
    
```

Leaf-02# **show ipv6 mld snooping membership vlan 102 source 2001:10:1:102::11 group FF06::239:1:1:2**Source/Group Interface Reporter

Vlan	Uptime	Last-Join/				Last-Leave
2001:10:1:102::11/FF06::239:1:1:2 \						
00:01:32 /			Gi1/0/11	FE80::46D3:CAFF:FE28:6CC2	102	1d00h
2001:10:1:102::11/FF06::239:1:1:2 \			Tu2	FE80::AC10:FE06	102	1d00h
1d00h /						

Leaf-02# **show l2vpn evpn evi 102 detail**

```

EVPN instance: 102 (VLAN Based)
RD: 172.16.254.4:102 (auto)
Import-RTs: 65001:102
    
```

```

Export-RTs:      65001:102
Per-EVI Label:  none
State:          Established
Replication Type: Static (global)
Encapsulation:  vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan:          102
  Protected:    False
  Ethernet-Tag: 0
  State:        Established
  Flood Suppress: Attached
  Core If:
  Access If:    Vlan102
  NVE If:       nve1
  RMAC:         0000.0000.0000
  Core Vlan:    0
  L2 VNI:       10102
  L3 VNI:       0
  VTEP IP:      172.16.254.4
  MCAST IP:     225.0.0.102
  VRF:
  IPv4 IRB:     Enabled (Asymmetric)
  IPv6 IRB:     Enabled (Asymmetric)
Pseudoports:
  GigabitEthernet1/0/11 service instance 102
  Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
  Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD
  172.16.254.6
  Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD

```

```

Leaf-02# show l2vpn evpn multicast local address FF06::239:1:1:2EVI VLAN Interface
Version Filter (Source, Group)

```

```

-----
102 102 Gi1/0/11 MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)

```

```

Leaf-02# show l2vpn evpn multicast remote address FF06::239:1:1:2EVI VLAN Originator
Version Filter (Source, Group)

```

```

-----
102 102 172.16.254.6 MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)

```

```

Leaf-02# show l2route evpn multicast routes group FF06::239:1:1:2

```

```

EVI ETAG Group Source
Next-hop(s)

```

```

-----
102 0 FF06::239:1:1:2 ::
    Gi1/0/11:102, V:10102 225.0.0.102

```

```

Leaf-02# show l2route evpn multicast smet group FF06::239:1:1:2EVI ETAG Origin
Group Filter Source(s)

```

```

-----
102 0 Gi1/0/11:102 FF06::239:1:1:2 INCLUDE
2001:10:1:102::11
102 0 172.16.254.6 FF06::239:1:1:2 INCLUDE
2001:10:1:102::11

```

```

Leaf-02# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 28
Paths: (1 available, best #1, table evi_102)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.4)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Local irb vxlan vtep:
    vrf:not found, l3-vni:0
    local router mac:0000.0000.0000
    core-irb interface:(not found)
    vtep-ip:172.16.254.4
    rx pathid: 0, tx pathid: 0x0
    Updated on Apr 7 2022 14:37:21 UTC

```

```

Leaf-02# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.6
BGP routing table entry for
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 46
Paths: (1 available, best #1, table evi_102)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51
(global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:38:47 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 32
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 7 2022 14:39:04 UTC
  Refresh Epoch 1
  Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:38:41 UTC

```

```

Leaf-02# show ipv6 mroute vrf green FF06::239:1:1:2
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

```

```

(2001:10:1:102::11, FF06::239:1:1:2), 1d00h/now, flags: SFTI
Incoming interface: Vlan102
RPF nbr: 2001:10:1:102::11
Outgoing interface list: Null

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 Traffic](#), on page 78.

### Outputs to verify configuration on VTEP 3

#### MLD exclude

```

Leaf-03# show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
Neighbor      Interface      Uptime/Expires   Ver   DR
Address
172.16.16.1   TenGigabitEthernet1/0/1  1d00h/00:01:29   v2    1 / S P G
172.16.26.2   TenGigabitEthernet1/0/2  1d00h/00:01:42   v2    1 / S P G

```

```

Leaf-03# show ip pim rp mapping
PIM Group-to-RP Mappings

```

```

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)

```

```

Leaf-03# show ip mroute 225.0.0.101
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                          t - LISP transit group
Timers: Uptime/Expires

```

```

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

(*, 225.0.0.101), 1d00h/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-Dense, 1d00h/00:02:43, flags:

(172.16.254.4, 225.0.0.101), 1d00h/00:01:45, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:56, flags:

(172.16.254.6, 225.0.0.101), 1d00h/00:02:59, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:20, flags:

(172.16.254.3, 225.0.0.101), 1d00h/00:01:34, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:43, flags:
    
```

```

Leaf-03# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address          EVI   VLAN  MAC Address      Source
-----
Y   10.1.101.1                          101   101   7c21.0dbd.9541  172.16.254.4
Y   2001:10:1:101::1                    101   101   7c21.0dbd.9541  172.16.254.4
    
```

```

Leaf-03# show ipv6 mld snooping querier vlan 101
IP address          : FE80:0:356:0:E75:BDF:FE67:EF00
MLD version        : v2
Port                : Switch
Max response time   : 10s
Query interval      : 125s
Robustness variable : 2
    
```

```

Leaf-03# show ipv6 mld snooping membership vlan 101 Snooping Membership Summary for Vlan 101
    
```

```

-----
Total number of channels: 1
Total number of hosts   : 2

Source/Group          Interface Reporter          Vlan Uptime
Last-Join/                                     Last-Leave
-----
::/FF06::239:1:1:1   Te1/0/10 FE80::EEE1:A9FF:FE37:92C1  101 00:00:00
00:00:05 /                                                    00:00:05

::/FF06::239:1:1:1   Tu0       FE80::AC10:FE04           101 1d00h
1d00h /
    
```

```

Leaf-03# show l2vpn evpn evi 101 detail
EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.6:101 (auto)
Import-RTs:         65001:101
Export-RTs:         65001:101
Per-EVI Label:     none
    
```

```

State:                Established
Replication Type:    Static (global)
Encapsulation:      vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway:  Disabled (global)
Re-originate RT5:   Disabled
Adv. Multicast:     Enabled (global)
Vlan:               101
  Protected:        False
  Ethernet-Tag:     0
  State:            Established
  Flood Suppress:   Attached
  Core If:
  Access If:
  NVE If:           nve1
  RMAC:             0000.0000.0000
  Core Vlan:        0
  L2 VNI:           10101
  L3 VNI:           0
  VTEP IP:          172.16.254.6
  MCAST IP:         225.0.0.101
Pseudoports:
  TenGigabitEthernet1/0/10 service instance 101
  Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
  Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD
  172.16.254.4
  Routes: 2 MAC, 3 MAC/IP, 0 IMET, 0 EAD

```

```

Leaf-03# show l2vpn evpn multicast local address FF06::239:1:1:1EVI  VLAN  Interface
Version  Filter  (Source, Group)

```

```

-----
101  101  Te1/0/10          MLDv2      EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-03# show l2vpn evpn multicast remote address FF06::239:1:1:1
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----

```

```

101  101  172.16.254.4      MLDv2      EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-03# show l2route evpn multicast routes group FF06::239:1:1:1EVI  ETAG      Group
Source          Next-hop(s)

```

```

-----
101  0          FF06::239:1:1:1          ::
      Te1/0/10:101, V:10101 225.0.0.101

```

```

Leaf-03# show l2route evpn multicast smet group FF06::239:1:1:1

```

```

EVI  ETAG      Origin          Group          Filter
Source(s)
-----

```

```

101  0          Te1/0/10:101          FF06::239:1:1:1          EXCLUDE
(*)MLDv2
101  0          172.16.254.4          FF06::239:1:1:1          EXCLUDE
(*)MLDv2

```

```

Leaf-03# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4

```

```

BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 25
Paths: (2 available, best #2, table EVPN-BGP-Table)

```



```

Flag: 0x100
Not advertised to any peer
Refresh Epoch 1
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on Apr 7 2022 14:39:04 UTC
Refresh Epoch 1
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:38:47 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 42
Paths: (1 available, best #1, table evi_101)
  Flag: 0x100
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35 (global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:38:47 UTC

Leaf-03# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 6
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
  1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Local irb vxlan vtep:
    vrf:not found, l3-vni:0
    local router mac:0000.0000.0000
    core-irb interface:(not found)
    vtep-ip:172.16.254.6
  rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:37:34 UTC

```

### **MLD include**

```

Leaf-03# show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable

```

```

Neighbor          Interface          Uptime/Expires   Ver   DR
Address
172.16.16.1       TenGigabitEthernet1/0/1  1d00h/00:01:19   v2    1 / S P G
172.16.26.2       TenGigabitEthernet1/0/2  1d00h/00:01:32   v2    1 / S P G

```

```
Leaf-03# show ip pim rp mapping PIM Group-to-RP Mappings
```

```

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)

```

```
Leaf-03# show ip mroute 225.0.0.102 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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                          t - LISP transit group

```

```
Timers: Uptime/Expires
```

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

```

(*, 225.0.0.102), 1d00h/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-Dense, 1d00h/00:02:37, flags:

(172.16.254.6, 225.0.0.102), 1d00h/00:03:28, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
  TenGigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:51, flags: A

(172.16.254.3, 225.0.0.102), 1d00h/00:01:08, flags: JTx
Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
Outgoing interface list:
  Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:51, flags:

(172.16.254.4, 225.0.0.102), 1d00h/00:01:07, flags: JTx
Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
Outgoing interface list:
  Tunnel0, Forward/Sparse-Dense, 1d00h/00:02:50, flags:

```

```
Leaf-03# show l2vpn evpn default-gateway vlan 102
```

```

Valid Default Gateway Address          EVI   VLAN   MAC Address      Source
-----
Y   10.1.102.1                          102   102    7c21.0dbd.954d  172.16.254.4
Y   2001:10:1:102::1                    102   102    7c21.0dbd.954d  172.16.254.4

```

```
Leaf-03# show ipv6 mld snooping querier vlan 102 IP address :
```

```

FE80:0:356:0:E75:BDF:FE67:EF00
MLD version          : v2
Port                 : Switch
Max response time    : 10s
Query interval       : 125s

```

Robustness variable : 2

Leaf-03# **show ipv6 mld snooping membership vlan 102 source 2001:10:1:102::11 group FF06::239:1:1:2**

Source/Group	Interface	Reporter	Vlan	Uptime	Last-Leave
2001:10:1:102::11/FF06::239:1:1:2 \	Tel1/0/11	FE80::EEE1:A9FF:FE37:92C2	102	1d00h	-
00:00:55 /					
2001:10:1:102::11/FF06::239:1:1:2 \	Tu0	FE80::AC10:FE04	102	1d00h	-
1d00h /					

Leaf-03# **show l2vpn evpn evi 102 detail**

```

EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.6:102 (auto)
Import-RTs:        65001:102
Export-RTs:         65001:102
Per-EVI Label:     none
State:              Established
Replication Type:   Static (global)
Encapsulation:     vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5:  Disabled
Adv. Multicast:     Enabled (global)
Vlan:               102
  Protected:        False
  Ethernet-Tag:     0
  State:            Established
  Flood Suppress:   Attached
Core If:
Access If:
NVE If:            nve1
RMAC:              0000.0000.0000
Core Vlan:         0
L2 VNI:            10102
L3 VNI:            0
VTEP IP:           172.16.254.6
MCAST IP:          225.0.0.102
Pseudoports:
  TenGigabitEthernet1/0/11 service instance 102
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 0 IMET, 0 EAD
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 0 IMET, 0 EAD

```

Leaf-03# **show l2vpn evpn multicast local address FF06::239:1:1:2**

EVI	VLAN	Interface	Version	Filter	(Source, Group)
102	102	Tel1/0/11	MLDv2	INCLUDE	(2001:10:1:102::11, FF06::239:1:1:2)

Leaf-03# **show l2vpn evpn multicast remote address FF06::239:1:1:2**

EVI	VLAN	Originator	Version	Filter	(Source, Group)
-----	------	------------	---------	--------	-----------------

```
-----
102 102 172.16.254.4 MLDv2 INCLUDE (2001:10:1:102::11, FF06::239:1:1:2)
```

```
Leaf-03# show l2route evpn multicast routes group FF06::239:1:1:2EVI ETAG Group
Source Next-hop(s)
```

```
-----
102 0 FF06::239:1:1:2 ::
Tel/0/11:102, V:10102 225.0.0.102
```

```
Leaf-03# show l2route evpn multicast smet group FF06::239:1:1:2
```

```
EVI ETAG Origin Group Filter
Source(s)
```

```
-----
102 0 Tel/0/11:102 FF06::239:1:1:2 INCLUDE
2001:10:1:102::11
102 0 172.16.254.4 FF06::239:1:1:2 INCLUDE
2001:10:1:102::11
```

```
Leaf-03# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.4BGP
routing table entry for
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 31
```

```
Paths: (2 available, best #2, table EVPN-BGP-Table)
```

```
Flag: 0x100
```

```
Not advertised to any peer
```

```
Refresh Epoch 1
```

```
Local
```

```
172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal
```

```
IGMP/MLD v2
```

```
Extended Community: RT:65001:102 ENCAP:8
```

```
Originator: 172.16.255.4, Cluster list: 172.16.255.2
```

```
rx pathid: 0, tx pathid: 0
```

```
Updated on Apr 7 2022 14:39:04 UTC
```

```
Refresh Epoch 1
```

```
Local
```

```
172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best
```

```
IGMP/MLD v2
```

```
Extended Community: RT:65001:102 ENCAP:8
```

```
Originator: 172.16.255.4, Cluster list: 172.16.255.1
```

```
rx pathid: 0, tx pathid: 0x0
```

```
Updated on Apr 7 2022 14:38:47 UTC
```

```
BGP routing table entry for
```

```
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51,
version 44
```

```
Paths: (1 available, best #1, table evi_102)
```

```
Flag: 0x100
```

```
Not advertised to any peer
```

```
Refresh Epoch 1
```

```
Local, imported path from
```

```
[6][172.16.254.4:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.4]/51
(global)
```

```
172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best
```

```
IGMP/MLD v2
```

```
Extended Community: RT:65001:102 ENCAP:8
```

```
Originator: 172.16.255.4, Cluster list: 172.16.255.1
```

```
rx pathid: 0, tx pathid: 0x0
```

Updated on Apr 7 2022 14:38:47 UTC

```
Leaf-03# show bgp l2vpn evpn route-type 6 0 2001:10:1:102::11 FF06::239:1:1:2 172.16.254.6
BGP routing table entry for
[6][172.16.254.6:102][0][128][2001:10:1:102::11][128][FF06::239:1:1:2][32][172.16.254.6]/51,
version 8
Paths: (1 available, best #1, table evi_102)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2
  Extended Community: RT:65001:102 ENCAP:8
  Local irb vxlan vtep:
    vrf: not found, l3-vni:0
    local router mac:0000.0000.0000
    core-irb interface: (not found)
    vtep-ip:172.16.254.6
    rx pathid: 0, tx pathid: 0x0
  Updated on Apr 7 2022 14:37:38 UTC
```

Return to [Verifying Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 Traffic, on page 78](#)

## Outputs to verify configuration on Spine Switch 1

### MLD exclude

```
Spine-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 38, main routing table version 38
37 network entries using 14208 bytes of memory
74 path entries using 16576 bytes of memory
5/5 BGP path/bestpath attribute entries using 1480 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
5 BGP extended community entries using 184 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 32568 total bytes of memory
BGP activity 37/0 prefixes, 74/0 paths, scan interval 60 secs
37 networks peaked at 14:48:25 Apr 7 2022 UTC (1d00h ago)
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.2	4	65001	1651	1650	38	0	0	1d00h	37
172.16.255.3	4	65001	1639	1658	38	0	0	1d00h	8
172.16.255.4	4	65001	1644	1651	38	0	0	1d00h	19
172.16.255.6	4	65001	1643	1652	38	0	0	1d00h	10

```
Spine-01# show ip pim neighbor
```

PIM Neighbor Table

Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,  
 P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,  
 L - DR Load-balancing Capable

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
172.16.13.3	GigabitEthernet1/0/1	1d00h/00:01:36	v2	1 / DR S P G
172.16.14.4	GigabitEthernet1/0/2	1d00h/00:01:25	v2	1 / DR S P G

```
172.16.16.6      GigabitEthernet1/0/4      1d00h/00:01:41      v2      1 / DR S P G
```

```
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# show ip msdp peer
```

```
MSDP Peer 172.16.254.2 (?), AS 65001 (configured AS)
Connection status:
  State: Up, Resets: 0, Connection source: Loopback1 (172.16.254.1)
  Uptime(Downtime): 1d00h, Messages sent/received: 1599/1600
  Output messages discarded: 0
  Connection and counters cleared 1d00h ago
SA Filtering:
  Input (S,G) filter: none, route-map: none
  Input RP filter: none, route-map: none
  Output (S,G) filter: none, route-map: none
  Output RP filter: none, route-map: none
SA-Requests:
  Input filter: none
Peer ttl threshold: 0
SAs learned from this peer: 4
Number of connection transitions to Established state: 1
  Input queue size: 0, Output queue size: 0
MD5 signature protection on MSDP TCP connection: not enabled
Message counters:
  RPF Failure count: 0
  SA Messages in/out: 1599/1588
  SA Requests in: 0
  SA Responses out: 0
  Data Packets in/out: 4/3
```

```
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,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
```

```
Timers: Uptime/Expires
```

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

```
(*, 224.0.1.40), 1d00h/00:02:26, RP 172.16.255.255, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  Loopback2, Forward/Sparse, 1d00h/00:02:26, flags:
```

```
(*, 225.0.0.102), 1d00h/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), 1d00h/00:02:37, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(*, 225.0.0.101), 1d00h/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, 225.0.0.101), 1d00h/00:01:21, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null
```

### MLD include

```
Spine-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 38, main routing table version 38
37 network entries using 14208 bytes of memory
74 path entries using 16576 bytes of memory
5/5 BGP path/bestpath attribute entries using 1480 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
5 BGP extended community entries using 184 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 32568 total bytes of memory
BGP activity 37/0 prefixes, 74/0 paths, scan interval 60 secs
37 networks peaked at 14:48:25 Apr 7 2022 UTC (1d00h ago)
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.2	4	65001	1661	1660	38	0	0	1d00h	37
172.16.255.3	4	65001	1649	1668	38	0	0	1d00h	8
172.16.255.4	4	65001	1654	1661	38	0	0	1d00h	19
172.16.255.6	4	65001	1653	1662	38	0	0	1d00h	10

```
Spine-01# show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
```

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
172.16.13.3	GigabitEthernet1/0/1	1d00h/00:01:36	v2	1 / DR S P G
172.16.14.4	GigabitEthernet1/0/2	1d00h/00:01:26	v2	1 / DR S P G
172.16.16.6	GigabitEthernet1/0/4	1d00h/00:01:40	v2	1 / DR S P G

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

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)

Spine-01# show ip msdp peerMSDP Peer 172.16.254.2 (?), AS 65001 (configured AS)
Connection status:
  State: Up, Resets: 0, Connection source: Loopback1 (172.16.254.1)
  Uptime(Downtime): 1d00h, Messages sent/received: 1610/1610
  Output messages discarded: 0
  Connection and counters cleared 1d00h ago
SA Filtering:
  Input (S,G) filter: none, route-map: none
  Input RP filter: none, route-map: none
  Output (S,G) filter: none, route-map: none
  Output RP filter: none, route-map: none
```

```

SA-Requests:
  Input filter: none
Peer ttl threshold: 0
SAs learned from this peer: 4
Number of connection transitions to Established state: 1
  Input queue size: 0, Output queue size: 0
MD5 signature protection on MSDP TCP connection: not enabled
Message counters:
  RPF Failure count: 0
  SA Messages in/out: 1609/1599
  SA Requests in: 0
  SA Responses out: 0
  Data Packets in/out: 4/3

```

```

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,
       e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                        t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 1d00h/00:02:06, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1d00h/00:02:06, flags:

(*, 225.0.0.102), 1d00h/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), 1d00h/00:01:34, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(*, 225.0.0.101), 1d00h/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, 225.0.0.101), 1d00h/00:01:59, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

```

Return to [Verifying Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 Traffic](#), on page 78



## Outputs to verify configuration on Spine Switch 2

### MLD exclude

```
Spine-02# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 38, main routing table version 38
37 network entries using 14208 bytes of memory
74 path entries using 16576 bytes of memory
5/5 BGP path/bestpath attribute entries using 1480 bytes of memory
3 BGP rinfo entries using 120 bytes of memory
5 BGP extended community entries using 184 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 32568 total bytes of memory
BGP activity 37/0 prefixes, 74/0 paths, scan interval 60 secs
37 networks peaked at 14:48:25 Apr 7 2022 UTC (1d00h ago)
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	1651	1653	38	0	0	1d00h	37
172.16.255.3	4	65001	1645	1655	38	0	0	1d00h	8
172.16.255.4	4	65001	1648	1656	38	0	0	1d00h	19
172.16.255.6	4	65001	1646	1653	38	0	0	1d00h	10

```
Spine-02# show ip pim neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
```

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
172.16.23.3	GigabitEthernet1/0/1	1d00h/00:01:29	v2	1 / DR S P G
172.16.24.4	GigabitEthernet1/0/2	1d00h/00:01:31	v2	1 / DR S P G
172.16.26.6	GigabitEthernet1/0/4	1d00h/00:01:34	v2	1 / DR S P G

```
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# show ip msdp peer
MSDP Peer 172.16.254.1 (?), AS 65001 (configured AS)
Connection status:
  State: Up, Resets: 0, Connection source: Loopback1 (172.16.254.2)
  Uptime(Downtime): 1d00h, Messages sent/received: 1602/1601
  Output messages discarded: 0
  Connection and counters cleared 1d00h ago
SA Filtering:
  Input (S,G) filter: none, route-map: none
  Input RP filter: none, route-map: none
  Output (S,G) filter: none, route-map: none
  Output RP filter: none, route-map: none
SA-Requests:
  Input filter: none
Peer ttl threshold: 0
SAs learned from this peer: 2
Number of connection transitions to Established state: 1
  Input queue size: 0, Output queue size: 0
MD5 signature protection on MSDP TCP connection: not enabled
Message counters:
  RPF Failure count: 0
  SA Messages in/out: 1593/1595
```

```
SA Requests in: 0
SA Responses out: 0
Data Packets in/out: 3/6
```

```
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,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 1d00h/00:03:18, RP 172.16.255.255, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:02:45, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:57, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:18, flags:
  Loopback2, Forward/Sparse, 1d00h/00:02:12, flags:

(*, 225.0.0.102), 1d00h/00:03:14, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:02:58, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:09, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:14, flags:

(172.16.254.6, 225.0.0.102), 1d00h/00:01:10, flags: T
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:14, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:09, flags:

(172.16.254.4, 225.0.0.102), 1d00h/00:02:58, flags: TA
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:00, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:14, flags:

(172.16.254.3, 225.0.0.102), 1d00h/00:03:08, flags: TA
Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:17, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:13, flags:

(*, 225.0.0.101), 1d00h/00:03:26, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:26, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:20, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:12, flags:
```

```
(172.16.254.6, 225.0.0.101), 1d00h/00:03:02, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:12, flags:
    GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:20, flags:

(172.16.254.4, 225.0.0.101), 1d00h/00:02:19, flags: TA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:26, flags:
    GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:12, flags:

(172.16.254.3, 225.0.0.101), 1d00h/00:02:20, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:26, flags:
    GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:20, flags:
```

### MLD include

```
Spine-02# show bgp l2vpn evpn summary BGP router identifier 172.16.255.2, local AS number
65001
BGP table version is 38, main routing table version 38
37 network entries using 14208 bytes of memory
74 path entries using 16576 bytes of memory
5/5 BGP path/bestpath attribute entries using 1480 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
5 BGP extended community entries using 184 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 32568 total bytes of memory
BGP activity 37/0 prefixes, 74/0 paths, scan interval 60 secs
37 networks peaked at 14:48:25 Apr 7 2022 UTC (1d00h ago)
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	1661	1662	38	0	0	1d00h	37
172.16.255.3	4	65001	1654	1664	38	0	0	1d00h	8
172.16.255.4	4	65001	1658	1665	38	0	0	1d00h	19
172.16.255.6	4	65001	1655	1663	38	0	0	1d00h	10

```
Spine-02# show ip pim neighbor PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable,
      L - DR Load-balancing Capable
```

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
172.16.23.3	GigabitEthernet1/0/1	1d00h/00:01:16	v2	1 / DR S P G
172.16.24.4	GigabitEthernet1/0/2	1d00h/00:01:17	v2	1 / DR S P G
172.16.26.6	GigabitEthernet1/0/4	1d00h/00:01:21	v2	1 / DR S P G

```
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# show ip msdp peer
MSDP Peer 172.16.254.1 (?), AS 65001 (configured AS)
Connection status:
  State: Up, Resets: 0, Connection source: Loopback1 (172.16.254.2)
  Uptime(Downtime): 1d00h, Messages sent/received: 1611/1610
```

```

Output messages discarded: 0
Connection and counters cleared 1d00h ago
SA Filtering:
Input (S,G) filter: none, route-map: none
Input RP filter: none, route-map: none
Output (S,G) filter: none, route-map: none
Output RP filter: none, route-map: none
SA-Requests:
Input filter: none
Peer ttl threshold: 0
SAs learned from this peer: 2
Number of connection transitions to Established state: 1
Input queue size: 0, Output queue size: 0
MD5 signature protection on MSDP TCP connection: not enabled
Message counters:
RPF Failure count: 0
SA Messages in/out: 1602/1604
SA Requests in: 0
SA Responses out: 0
Data Packets in/out: 3/6

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,
e - encaps-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 1d00h/00:03:19, RP 172.16.255.255, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:02, flags:
GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:19, flags:
GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:02:41, flags:
Loopback2, Forward/Sparse, 1d00h/00:02:38, flags:

(*, 225.0.0.102), 1d00h/00:03:19, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:19, flags:
GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:30, flags:
GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:02:37, flags:

(172.16.254.6, 225.0.0.102), 1d00h/00:01:58, flags: T
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:02:59, flags:
GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:57, flags:

(172.16.254.4, 225.0.0.102), 1d00h/00:03:09, flags: TA

```

```

Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:23, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:02:53, flags:

(172.16.254.3, 225.0.0.102), 1d00h/00:03:06, flags: TA
Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:03:19, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:36, flags:

(*, 225.0.0.101), 1d00h/00:02:46, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:02:46, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:42, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:02:33, flags:

(172.16.254.6, 225.0.0.101), 1d00h/00:01:52, flags: MT
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:02:58, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:03:08, flags:

(172.16.254.4, 225.0.0.101), 1d00h/00:02:39, flags: TA
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:02:53, flags:
  GigabitEthernet1/0/1, Forward/Sparse, 1d00h/00:03:01, flags:

(172.16.254.3, 225.0.0.101), 1d00h/00:02:37, flags: TA
Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d00h/00:02:46, flags:
  GigabitEthernet1/0/2, Forward/Sparse, 1d00h/00:02:59, flags:

```

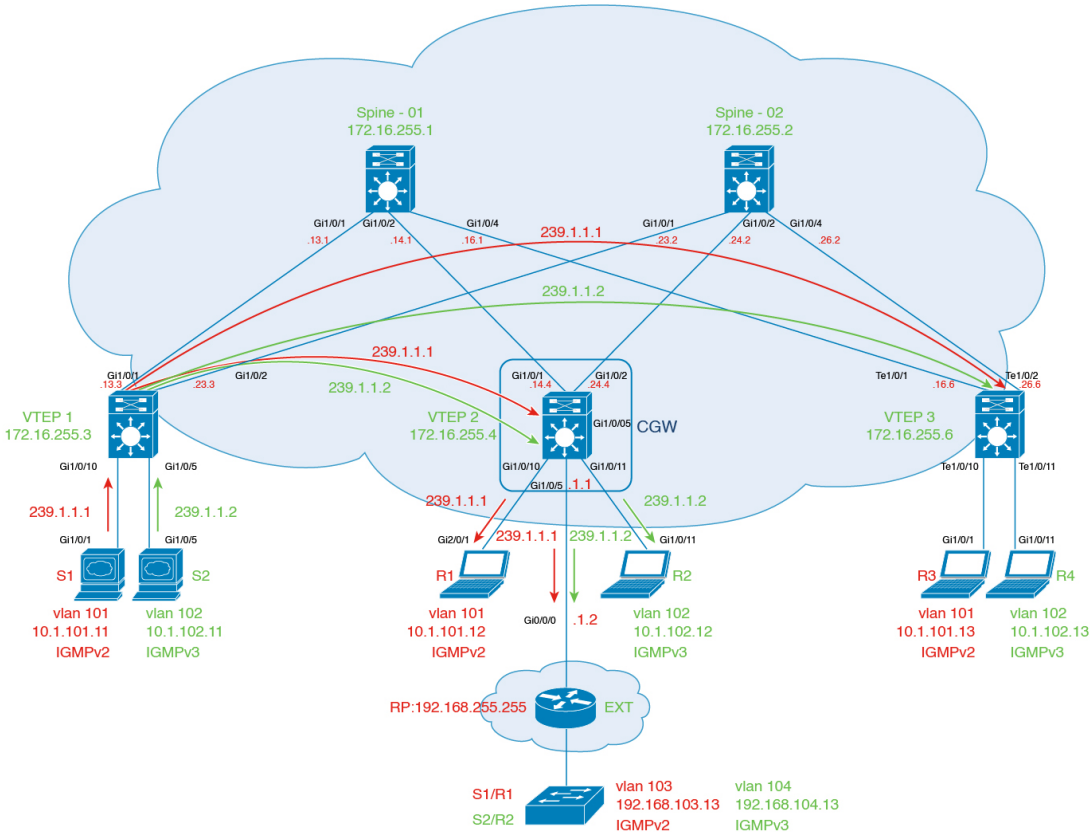
Return to [Verifying Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 Traffic](#), on page 78

## Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4

This example shows how to configure Optimized Layer 2 Overlay Multicast for IPv4 multicast traffic in an EVPN VXLAN fabric that has ingress replication enabled in the underlay and multicast traffic is handed off to an external network.

Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4

Figure 8: Topology Showing Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 Traffic



The topology shows an EVPN VXLAN fabric, with two spine switches and three VTEPs, connected to an external network. Centralized gateway is configured on VTEP 2. The source is connected to VTEP 1 and receivers are spread across VTEP 3, centralized gateway, and the external network. VLAN 101 has IGMPv2 and VLAN 102 has IGMPv3 enabled. The rendezvous point (RP) is located outside the EVPN VXLAN fabric. The following tables provide sample configurations for the devices in this topology.

*Table 9: Configure VTEP1, CGW, and VTEP3*

VTEP1	CGW	VTEP3
-------	-----	-------

## Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4

VTEP1	CGW	VTEP3
<pre> Leaf-01#show running-config hostname Leaf-01 ! ip routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.3 ip igmp snooping querier ! l2vpn evpn replication-type ingress router-id Loopback1 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/5 switchport access vlan 102 switchport mode access ! interface GigabitEthernet1/0/10 switchport access vlan 101 </pre>	<pre> Leaf-02#show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 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 vrf green ! l2vpn evpn replication-type ingress router-id Loopback1 default-gateway advertise multicast 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 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet0/0 vrf forwarding Mgmt-vrf ip address 10.62.149.182 255.255.255.0 negotiation auto ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 </pre>	<pre> Leaf-03#show running-config hostname Leaf-03 ! ip routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.6 ip igmp snooping querier ! l2vpn evpn replication-type ingress router-id Loopback1 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! </pre>



VTEP1	CGW	VTEP3
<pre> switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>	<pre> 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 ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/5 no switchport mtu 1500 vrf forwarding green ip address 192.168.1.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface GigabitEthernet1/0/11 switchport access vlan 102 switchport mode access spanning-tree portfast ! 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 ip igmp version 3 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! router ospf 2 vrf green redistribute connected redistribute bgp 65001 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes </pre>	<pre> interface TenGigabitEthernet1/0/11 switchport access vlan 102 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>

## Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4

VTEP1	CGW	VTEP3
	<pre> 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 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 static redistribute connected redistribute ospf 2 match internal external 1 external 2 exit-address-family ! ip pim vrf green rp-address 192.168.255.255 ! end </pre>	

Table 10: Configure Spine Switch 1, Spine Switch 2, and External Device

Spine Switch 1	Spine Switch 2	External Device
		<pre> EXT#show running-config hostname EXT ! ip multicast-routing distributed ! bridge-domain 103 bridge-domain 104 ! interface Loopback255 ip address 192.168.255.255 255.255.255.255 ip pim sparse-mode ip ospf 2 area 0 ! interface GigabitEthernet0/0/0 ip address 192.168.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 negotiation auto ! interface GigabitEthernet0/0/3 no ip address negotiation auto service instance 103 ethernet encapsulation default bridge-domain 103 ! service instance 104 ethernet encapsulation dot1q 104 rewrite ingress tag pop 1 symmetric bridge-domain 104 ! interface BDI103 ip address 192.168.103.1 255.255.255.0 ip pim sparse-mode ip ospf 2 area 0 ! interface BDI104 ip address 192.168.104.1 255.255.255.0 ip pim sparse-mode ip ospf 2 area 0 ! router ospf 2 passive-interface BDI103 passive-interface BDI104 ! no ip http server no ip http secure-server no ip forward-protocol nd ! ip pim rp-address 192.168.255.255 ! end                     </pre>

## Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4

Spine Switch 1	Spine Switch 2	External Device
<pre> Spine-01#show running-config hostname Spine-01 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 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 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 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 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 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 </pre>	<pre> Spine-02#show running-config hostname Spine-02 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 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 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 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 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 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 </pre>	

Spine Switch 1	Spine Switch 2	External Device
<pre> exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both 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 ! end </pre>	<pre> exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 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 ! end </pre>	

To return, click [Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#), on page 109.

To return to the Configuration Examples section, click [Configuration Examples for Optimized Layer 2 Overlay Multicast](#), on page 10.

## Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4

The following sections provide sample output of **show** commands to verify Optimized Layer 2 Overlay Multicast configuration for IPv4 multicast traffic handoff to an external network, on the devices in the [Figure 8: Topology Showing Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 Traffic](#).

[Outputs to Verify Configuration on VTEP 1](#)

[Outputs to Verify Configuration on Centralized Gateway](#)

[Outputs to Verify Configuration on VTEP 3](#)

[Outputs to Verify Configuration on the External Device](#)

[Outputs to Verify Configuration on Spine Switch 1](#)

[Outputs to Verify Configuration on Spine Switch 2](#)

### Outputs to Verify Configuration on VTEP 1

#### Verify IGMPv2

```

Leaf-01# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address          EVI    VLAN  MAC Address    Source

```

```
-----
Y 10.1.101.1 101 101 7c21.0dbd.9541 172.16.254.4
```

```
Leaf-01# show ip igmp snooping querier vlan 101
```

```
IP address      : 172.16.254.3
IGMP version    : v3
Port            : Switch
Max response time : 10s
Query interval  : 60s
Robustness variable : 2
```

```
Leaf-01# show ip igmp snooping groups vlan 101
```

```
-----
Vlan      Group          Type      Version  Port List
-----
101       239.1.1.1          igmp      v2       Tu0
```

```
Leaf-01# show l2vpn evpn evi 101 detail
```

```
EVPN instance: 101 (VLAN Based)
RD:            172.16.254.3:101 (auto)
Import-RTs:    65001:101
Export-RTs:    65001:101
Per-EVI Label: none
State:         Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan:          101
  Protected:   False
  Ethernet-Tag: 0
  State:       Established
  Flood Suppress: Attached
  Core If:
  Access If:
  NVE If:      nve1
  RMAC:        0000.0000.0000
  Core Vlan:   0
  L2 VNI:      10101
  L3 VNI:      0
  VTEP IP:     172.16.254.3
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 1 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
```

```
Leaf-01# show l2vpn evpn multicast local address 239.1.1.1EVI  VLAN  Interface  Version
Filter (Source, Group)
-----
```

```
Leaf-01# show l2vpn evpn multicast remote address 239.1.1.1
```

```
-----
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----
101  101    172.16.254.4        IGMPv2  N/A     (*, 239.1.1.1)
101  101    172.16.254.6        IGMPv2  N/A     (*, 239.1.1.1)
```

```
Leaf-01# show l2route evpn multicast routes group 239.1.1.1 EVI ETAG Group
Source Next-hop(s)
-----
101 0 239.1.1.1 * V:10101 172.16.254.4, V:10101 172.16.254.6
```

```
Leaf-01# show l2route evpn multicast smet group 239.1.1.1
EVI ETAG Origin Group Filter Source(s)
-----
101 0 172.16.254.4 239.1.1.1 N/A (*) IGMPv2
101 0 172.16.254.6 239.1.1.1 N/A (*) IGMPv2
```

```
Leaf-01# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.4
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 33
Paths: (1 available, best #1, table evi_101)
Not advertised to any peer
Refresh Epoch 1
Local, imported path from [6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23
(global)
172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v2
Extended Community: RT:65001:101 ENCAP:8
Originator: 172.16.255.4, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on May 6 2022 10:23:03 UTC
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 17
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 1
Local
172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
Origin incomplete, metric 0, localpref 100, valid, internal
IGMP/MLD v2
Extended Community: RT:65001:101 ENCAP:8
Originator: 172.16.255.4, Cluster list: 172.16.255.2
rx pathid: 0, tx pathid: 0
Updated on May 6 2022 10:23:15 UTC
Refresh Epoch 1
Local
172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v2
Extended Community: RT:65001:101 ENCAP:8
Originator: 172.16.255.4, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on May 6 2022 10:22:59 UTC
```

```
Leaf-01# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.6 BGP routing table entry
for [6][172.16.254.3:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 245
Paths: (1 available, best #1, table evi_101)
Not advertised to any peer
Refresh Epoch 1
Local, imported path from [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23
(global)
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v2
Extended Community: RT:65001:101 ENCAP:8
Originator: 172.16.255.6, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
```

```

Updated on May 6 2022 14:12:06 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 243
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 1
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on May 6 2022 14:12:06 UTC
Refresh Epoch 1
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 14:12:06 UTC

```

### Verify IGMPv3

```

Leaf-01# show l2vpn evpn default-gateway vlan 102
Valid Default Gateway Address      EVI    VLAN  MAC Address      Source
-----
Y   10.1.102.1                    102   102   7c21.0dbd.954d  172.16.254.4

```

```

Leaf-01#show ip igmp snooping querier vlan 102
IP address      : 172.16.254.3
IGMP version    : v3
Port           : Switch
Max response time : 10s
Query interval  : 60s
Robustness variable : 2

```

```

Leaf-01# show ip igmp snooping groups vlan 102
Vlan    Group          Type          Version      Port List
-----
102     239.1.1.2       igmp          v2,v3       Tu0

```

```

Leaf-01# show l2vpn evpn evi 102 detail
EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.3:102 (auto)
Import-RTs:         65001:102
Export-RTs:         65001:102
Per-EVI Label:      none
State:              Established
Replication Type:   Ingress (global)
Encapsulation:      vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway:  Disabled (global)
Re-originate RT5:   Disabled
Adv. Multicast:     Enabled (global)
Vlan:               102
  Protected:        False
  Ethernet-Tag:     0
  State:            Established
  Flood Suppress:   Attached

```



```

Core If:
Access If:
NVE If:      nve1
RMAC:       0000.0000.0000
Core Vlan:   0
L2 VNI:     10102
L3 VNI:     0
VTEP IP:    172.16.254.3
Pseudoports:
  GigabitEthernet1/0/5 service instance 102
    Routes: 1 MAC, 1 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD

```

Leaf-01# **show l2vpn evpn multicast local address 239.1.1.2**

```

EVI  VLAN  Interface      Version  Filter (Source, Group)
-----

```

Leaf-01# **show l2vpn evpn multicast remote address 239.1.1.2**

```

EVI  VLAN  Originator      Version  Filter (Source, Group)
-----
102  102   172.16.254.4    IGMPv2   N/A      (*, 239.1.1.2)
102  102   172.16.254.4    IGMPv3   INCLUDE  (10.1.102.11, 239.1.1.2)
102  102   172.16.254.6    IGMPv2   N/A      (*, 239.1.1.2)
102  102   172.16.254.6    IGMPv3   INCLUDE  (192.168.104.13, 239.1.1.2)

```

Leaf-01# **show l2route evpn multicast routes group 239.1.1.2**

```

EVI  ETAG  Group          Source          Next-hop(s)
-----
102  0     239.1.1.2     *               V:10102 172.16.254.4, V:10102 172.16.254.6

```

Leaf-01# **show l2route evpn multicast smet group 239.1.1.2**

```

EVI  ETAG  Origin          Group          Filter          Source(s)
-----
102  0     172.16.254.4   239.1.1.2     INCLUDE        (*) IGMPv2 10.1.102.11
102  0     172.16.254.6   239.1.1.2     INCLUDE        (*) IGMPv2 192.168.104.13

```

Leaf-01# **show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.4**

```

BGP routing table entry for
[6][172.16.254.3:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 48
Paths: (1 available, best #1, table evi_102)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27 (global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 12:24:12 UTC
BGP routing table entry for
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 46
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer

```

```

Refresh Epoch 1
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on May 6 2022 12:24:12 UTC
Refresh Epoch 1
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 12:24:12 UTC

```

```

Leaf-01# show bgp l2vpn evpn route-type 6 0 192.168.104.13 239.1.1.2 172.16.254.6 BGP routing
table entry for
[6][172.16.254.3:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27, version
122
Paths: (1 available, best #1, table evi_102)
Not advertised to any peer
Refresh Epoch 1
Local, imported path from
[6][172.16.254.6:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27 (global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 12:25:57 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27, version
121
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 1
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on May 6 2022 12:25:57 UTC
Refresh Epoch 1
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 12:2

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

## Outputs to Verify Configuration on Centralized Gateway

### Verify IGMPv2

Leaf-02# **show l2vpn evpn default-gateway vlan 101**

Valid	Default Gateway Address	EVI	VLAN	MAC Address	Source
Y	10.1.101.1	101	101	7c21.0dbd.9541	Vl101

Leaf-02# **show ip igmp snooping querier vlan 101**

```
IP address       : 10.1.101.1
IGMP version    : v2
Port            : Router
Max response time : 10s
```

Leaf-02# **show ip igmp snooping groups vlan 101**

Vlan	Group	Type	Version	Port List
101	239.1.1.1	igmp	v2	Gil/0/10, Tu0

Leaf-02# **show l2vpn evpn evi 101 detail**

```
EVPN instance: 101 (VLAN Based)
RD: 172.16.254.4:101 (auto)
Import-RTs: 65001:101
Export-RTs: 65001:101
Per-EVI Label: none
State: Established
Replication Type: Ingress (global)
Encapsulation: vxlan
IP Local Learn: Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 101
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
Core If:
Access If: Vlan101
NVE If: nve1
RMAC: 0000.0000.0000
Core Vlan: 0
L2 VNI: 10101
L3 VNI: 0
VTEP IP: 172.16.254.4
VRF:
IPv4 IRB: Enabled (Asymmetric)
IPv6 IRB: Disabled
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
  Routes: 1 MAC, 1 MAC/IP
Peers:
  172.16.254.3
  Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
  Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
```

Leaf-02# **show l2vpn evpn multicast local address 239.1.1.1** EVI VLAN Interface Version  
Filter (Source, Group)

```
-----
```

Leaf	Port	Group	Protocol	Source	Next-hop(s)
101	101	Gil/0/10	IGMPv2	N/A	(* , 239.1.1.1)

```
Leaf-02# show l2route evpn multicast routes group 239.1.1.1
```

```
-----
```

EVI	ETAG	Group	Source	Next-hop(s)
101	0	239.1.1.1	*	Gil/0/10:101, V:10101 172.16.254.6

```
Leaf-02# show l2route evpn multicast smet group 239.1.1.1
```

EVI	ETAG	Origin
101	0	(*) IGMPv2

```
-----
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.4
```

```
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 16
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
    :: (via default) from 0.0.0.0 (172.16.255.4)
      Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Local irb vxlan vtep:
        vrf:not found, l3-vni:0
        local router mac:0000.0000.0000
        core-irb interface:(not found)
        vtep-ip:172.16.254.4
        rx pathid: 0, tx pathid: 0x0
        Updated on May 6 2022 10:20:56 UTC
```

```
Leaf-02# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.6
```

```
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 208
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23
  (global)
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on May 6 2022 14:12:06 UTC
  BGP routing table entry for
  [6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 206
  Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
```

```

    rx pathid: 0, tx pathid: 0
    Updated on May 6 2022 14:12:06 UTC
Refresh Epoch 1
Local
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 14:12:06 UTC

```

Leaf-02# **show ip mroute vrf green 239.1.1.1**

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, l - LISP decap ref count contributor  
 Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join  
 t - LISP transit group

Timers: Uptime/Expires

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

```

(*, 239.1.1.1), 05:51:44/stopped, RP 192.168.255.255, flags: SJCF
  Incoming interface: GigabitEthernet1/0/5, RPF nbr 192.168.1.2
  Outgoing interface list:
    Vlan101, Forward/Sparse, 05:51:44/00:02:14, flags:

(192.168.103.13, 239.1.1.1), 00:11:18/00:01:47, flags: JT
  Incoming interface: GigabitEthernet1/0/5, RPF nbr 192.168.1.2
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:11:18/00:02:14, flags:

(10.1.101.11, 239.1.1.1), 01:49:45/00:01:58, flags: FT
  Incoming interface: Vlan101, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/5, Forward/Sparse, 00:10:52/00:03:02, flags:

```

Leaf-02#show ip igmp vrf green groups 239.1.1.1 detail

Flags: L - Local, U - User, SG - Static Group, VG - Virtual Group,  
 SS - Static Source, VS - Virtual Source,  
 Ac - Group accounted towards access control limit

```

Interface:      Vlan101
Group:          239.1.1.1
Flags:
Uptime:        05:51:45
Group mode:    EXCLUDE (Expires: 00:02:14)
Last reporter: 10.1.101.12
Source list is empty

```

### Verify IPGMv3

```
Leaf-02# show l2vpn evpn default-gateway vlan 102
Valid Default Gateway Address          EVI   VLAN  MAC Address   Source
-----
Y   10.1.102.1                          102   102   7c21.0dbd.954d V1102
```

```
Leaf-02# show ip igmp snooping querier vlan 102
IP address           : 10.1.102.1
IGMP version         : v3
Port                 : Router
Max response time    : 10s
Query interval       : 60s
Robustness variable  : 2
```

```
Leaf-02# show ip igmp snooping groups vlan 102
Vlan   Group           Type           Version        Port List
-----
102    239.1.1.2          igmp           v2,v3         Gi1/0/11, Tu0
```

```
Leaf-02# show l2vpn evpn evi 102 detail
EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.4:102 (auto)
Import-RTs:         65001:102
Export-RTs:         65001:102
Per-EVI Label:      none
State:              Established
Replication Type:   Ingress (global)
Encapsulation:      vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway:  Enabled (global)
Re-originate RT5:  Disabled
Adv. Multicast:     Enabled (global)
Vlan:               102
  Protected:        False
  Ethernet-Tag:     0
  State:            Established
  Flood Suppress:   Attached
  Core If:
  Access If:        Vlan102
  NVE If:           nve1
  RMAC:             0000.0000.0000
  Core Vlan:        0
  L2 VNI:           10102
  L3 VNI:           0
  VTEP IP:          172.16.254.4
  VRF:
  IPv4 IRB:         Enabled (Asymmetric)
  IPv6 IRB:         Disabled
Pseudoports:
  GigabitEthernet1/0/11 service instance 102
    Routes: 1 MAC, 1 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
```

```
Leaf-02# show l2vpn evpn multicast local address 239.1.1.2
EVI   VLAN  Interface          Version  Filter (Source, Group)
```

```

-----
102 102 Gi1/0/11 IGMPv2 N/A (*, 239.1.1.2)
102 102 Gi1/0/11 IGMPv3 INCLUDE (10.1.102.11, 239.1.1.2)

Leaf-02# show l2vpn evpn multicast remote address 239.1.1.2
EVI VLAN Originator Version Filter (Source, Group)
-----
102 102 172.16.254.6 IGMPv2 N/A (*, 239.1.1.2)
102 102 172.16.254.6 IGMPv3 INCLUDE (192.168.104.13, 239.1.1.2)

Leaf-02# show l2route evpn multicast routes group 239.1.1.2
EVI ETAG Group
Source Next-hop(s)
-----
102 0 239.1.1.2 * Gi1/0/11:102, V:10102 172.16.254.6

Leaf-02# show l2route evpn multicast smet group 239.1.1.2
EVI ETAG Origin
Group Filter Source(s)
-----
102 0 Gi1/0/11:102 239.1.1.2 INCLUDE (*) IGMPv2 10.1.102.11
102 0 172.16.254.6 239.1.1.2 INCLUDE (*) IGMPv2 192.168.104.13

Leaf-02# show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.4
BGP routing table entry for [6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 50
Paths: (1 available, best #1, table evi_102)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.4)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Local irb vxlan vtep:
    vrf:not found, l3-vni:0
    local router mac:0000.0000.0000
    core-irb interface:(not found)
    vtep-ip:172.16.254.4
    rx pathid: 0, tx pathid: 0x0
    Updated on May 6 2022 12:24:12 UTC

Leaf-02# show bgp l2vpn evpn route-type 6 0 192.168.104.13 239.1.1.2 172.16.254.6
BGP routing table entry for
[6][172.16.254.4:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27, version 93
Paths: (1 available, best #1, table evi_102)
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from
[6][172.16.254.6:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27 (global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v3
  Extended Community: RT:65001:102 ENCAP:8
  Originator: 172.16.255.6, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 6 2022 12:25:57 UTC
BGP routing table entry for

```

```
[6][172.16.254.6:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27, version
91
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
    Origin incomplete, metric 0, localpref 100, valid, internal
    IGMP/MLD v3
    Extended Community: RT:65001:102 ENCAP:8
    Originator: 172.16.255.6, Cluster list: 172.16.255.2
    rx pathid: 0, tx pathid: 0
    Updated on May 6 2022 12:25:57 UTC
  Refresh Epoch 1
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    IGMP/MLD v3
    Extended Community: RT:65001:102 ENCAP:8
    Originator: 172.16.255.6, Cluster list: 172.16.255.1
    rx pathid: 0, tx pathid: 0x0
    Updated on May 6 2022 12:25:57 UTC
```

```
Leaf-02# show ip mroute vrf green 239.1.1.2IP 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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                        t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(10.1.102.11, 239.1.1.2), 00:14:59/00:03:28, flags: sTI
  Incoming interface: Vlan102, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/5, Forward/Sparse, 00:08:53/00:03:28, flags:

(192.168.104.13, 239.1.1.2), 00:15:06/00:02:53, flags: sTI
  Incoming interface: GigabitEthernet1/0/5, RPF nbr 192.168.1.2
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:15:06/00:02:53, flags:
```

```
Leaf-02# show ip igmp vrf green groups 239.1.1.1 detail
```

```
Flags: L - Local, U - User, SG - Static Group, VG - Virtual Group,
SS - Static Source, VS - Virtual Source,
Ac - Group accounted towards access control limit

Interface:      Vlan101
Group:          239.1.1.1
Flags:
Uptime:        06:44:06
```



```

Group mode:      EXCLUDE (Expires: 00:02:57)
Last reporter:  10.1.101.12
Source list is empty
Leaf-02#!

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

### Outputs to Verify Configuration on VTEP 3

#### Verify IGMPv2

```
Leaf-03# show l2vpn evpn default-gateway vlan 101 Valid Default Gateway Address
```

EVI	VLAN	MAC Address	Source
Y	10.1.101.1		101 101 7c21.0dbd.9541 172.16.254.4

```

Leaf-03# show ip igmp snooping querier vlan 101 IP address          : 172.16.254.6
IGMP version          : v3
Port                  : Switch
Max response time     : 10s
Query interval        : 60s
Robustness variable   : 2

```

```
Leaf-03# show ip igmp snooping groups vlan 101
```

Vlan	Group	Type	Version	Port List
101	239.1.1.1	igmp	v2	Tel/0/10, Tu0

```
Leaf-03# show l2vpn evpn evi 101 detail EVPN instance:          101 (VLAN Based)
```

```

RD:                  172.16.254.6:101 (auto)
Import-RTs:          65001:101
Export-RTs:           65001:101
Per-EVI Label:       none
State:                Established
Replication Type:    Ingress (global)
Encapsulation:       vxlan
IP Local Learn:      Enabled (global)
Adv. Def. Gateway:   Disabled (global)
Re-originate RT5:    Disabled
Adv. Multicast:      Enabled (global)
Vlan:                101
  Protected:         False
  Ethernet-Tag:      0
  State:              Established
  Flood Suppress:    Attached
Core If:
Access If:
NVE If:              nve1
RMAC:                0000.0000.0000
Core Vlan:           0
L2 VNI:              10101
L3 VNI:              0
VTEP IP:             172.16.254.6
Pseudoports:
  TenGigabitEthernet1/0/10 service instance 101
  Routes: 1 MAC, 1 MAC/IP
Peers:

```

```

172.16.254.3
  Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
172.16.254.4
  Routes: 2 MAC, 2 MAC/IP, 1 IMET, 0 EAD

```

```

Leaf-03# show l2vpn evpn multicast local address 239.1.1.1
EVI  VLAN  Interface          Version  Filter  (Source, Group)
-----
101  101    Te1/0/10           IGMPv2  N/A     (*, 239.1.1.1)

```

```

Leaf-03# show l2vpn evpn multicast remote address 239.1.1.1
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----
101  101    172.16.254.4       IGMPv2  N/A     (*, 239.1.1.1)

```

```

Leaf-03# show l2route evpn multicast routes group 239.1.1.1
EVI  ETAG  Group
Source  Next-hop(s)
-----
101  0     239.1.1.1          *          V:10101 172.16.254.4, Te1/0/10:101

```

```

Leaf-03# show l2route evpn multicast smet group 239.1.1.1
EVI  ETAG  Origin              Group          Filter  Source(s)
-----
101  0     Te1/0/10:101       239.1.1.1     N/A     (*) IGMPv2
101  0     172.16.254.4       239.1.1.1     N/A     (*) IGMPv2

```

```

Leaf-03# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 10
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Flag: 0x100
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on May 6 2022 10:23:15 UTC
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.4, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on May 6 2022 10:22:59 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23, version 25
Paths: (1 available, best #1, table evi_101)
  Flag: 0x100
  Not advertised to any peer
  Refresh Epoch 1
  Local, imported path from [6][172.16.254.4:101][0][0][*][32][239.1.1.1][32][172.16.254.4]/23

```

```
(global)
 172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
   Origin incomplete, metric 0, localpref 100, valid, internal, best
   IGMP/MLD v2
   Extended Community: RT:65001:101 ENCAP:8
   Originator: 172.16.255.4, Cluster list: 172.16.255.1
   rx pathid: 0, tx pathid: 0x0
   Updated on May 6 2022 10:22:59 UTC

Leaf-03# show bgp l2vpn evpn route-type 6 0 * 239.1.1.1 172.16.254.6
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][32][239.1.1.1][32][172.16.254.6]/23, version 125
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
    1
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
   Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
   IGMP/MLD v2
   Extended Community: RT:65001:101 ENCAP:8
   Local irb vxlan vtep:
     vrf:not found, l3-vni:0
     local router mac:0000.0000.0000
     core-irb interface:(not found)
     vtep-ip:172.16.254.6
   rx pathid: 0, tx pathid: 0x0
   Updated on May 6 2022 14:12:06 UTC
```

### Verify IGMPv3

```
Leaf-03# show l2vpn evpn default-gateway vlan 102
Valid Default Gateway Address          EVI    VLAN  MAC Address      Source
-----
Y   10.1.102.1                          102   102   7c21.0dbd.954d  172.16.254.4
```

```
Leaf-03# show ip igmp snooping querier vlan 102
IP address          : 172.16.254.6
IGMP version        : v3
Port                : Switch
Max response time   : 10s
Query interval      : 60s
Robustness variable : 2
```

```
Leaf-03# show ip igmp snooping groups vlan 102
Vlan    Group          Type          Version    Port List
-----
102     239.1.1.2         igmp          v2,v3     Te1/0/11, Tu0
```

```
Leaf-03# show l2vpn evpn evi 102 detail
EVPN instance:      102 (VLAN Based)
RD:                 172.16.254.6:102 (auto)
Import-RTs:         65001:102
Export-RTs:         65001:102
Per-EVI Label:      none
State:              Established
Replication Type:   Ingress (global)
Encapsulation:      vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway:  Disabled (global)
```

```

Re-originate RT5: Disabled
Adv. Multicast: Enabled (global)
Vlan: 102
  Protected: False
  Ethernet-Tag: 0
  State: Established
  Flood Suppress: Attached
  Core If:
  Access If:
  NVE If: nve1
  RMAC: 0000.0000.0000
  Core Vlan: 0
  L2 VNI: 10102
  L3 VNI: 0
  VTEP IP: 172.16.254.6
Pseudoports:
  TenGigabitEthernet1/0/11 service instance 102
  Routes: 1 MAC, 1 MAC/IP
Peers:
  172.16.254.3
  Routes: 1 MAC, 1 MAC/IP, 1 IMET, 0 EAD
  172.16.254.4
  Routes: 2 MAC, 2 MAC/IP, 1 IMET, 0 EAD

```

Leaf-03# **show l2vpn evpn multicast local address 239.1.1.2**

EVI	VLAN	Interface	Version	Filter	(Source, Group)
102	102	Tel/0/11	IGMPv2	N/A	(*, 239.1.1.2)
102	102	Tel/0/11	IGMPv3	INCLUDE	(192.168.104.13, 239.1.1.2)

Leaf-03# **show l2vpn evpn multicast remote address 239.1.1.2**

EVI	VLAN	Originator	Version	Filter	(Source, Group)
102	102	172.16.254.4	IGMPv2	N/A	(*, 239.1.1.2)
102	102	172.16.254.4	IGMPv3	INCLUDE	(10.1.102.11, 239.1.1.2)

Leaf-03# **show l2route evpn multicast routes group 239.1.1.2** EVI ETAG Group

Source	Next-hop(s)	EVI	ETAG	Group
102	0	239.1.1.2	*	Tel/0/11:102, V:10102 172.16.254.4

Leaf-03# **show l2route evpn multicast smet group 239.1.1.2** EVI ETAG Origin

Group	Filter	Source(s)	EVI	ETAG	Origin
102	0	Tel/0/11:102	239.1.1.2	INCLUDE	(*) IGMPv2 192.168.104.13
102	0	172.16.254.4	239.1.1.2	INCLUDE	(*) IGMPv2 10.1.102.11

Leaf-03# **show bgp l2vpn evpn route-type 6 0 10.1.102.11 239.1.1.2 172.16.254.4**

```

BGP routing table entry for
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 48
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
    Origin incomplete, metric 0, localpref 100, valid, internal
    IGMP/MLD v3
    Extended Community: RT:65001:102 ENCAP:8
    Originator: 172.16.255.4, Cluster list: 172.16.255.2
    rx pathid: 0, tx pathid: 0

```

```

Updated on May 6 2022 12:24:12 UTC
Refresh Epoch 1
Local
172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v3
Extended Community: RT:65001:102 ENCAP:8
Originator: 172.16.255.4, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on May 6 2022 12:24:12 UTC
BGP routing table entry for
[6][172.16.254.6:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27, version 50
Paths: (1 available, best #1, table evi_102)
Not advertised to any peer
Refresh Epoch 1
Local, imported path from
[6][172.16.254.4:102][0][32][10.1.102.11][32][239.1.1.2][32][172.16.254.4]/27 (global)
172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
Origin incomplete, metric 0, localpref 100, valid, internal, best
IGMP/MLD v3
Extended Community: RT:65001:102 ENCAP:8
Originator: 172.16.255.4, Cluster list: 172.16.255.1
rx pathid: 0, tx pathid: 0x0
Updated on May 6 2022 12:24:12 UTC

Leaf-03# show bgp l2vpn evpn route-type 6 0 192.168.104.13 239.1.1.2 172.16.254.6
BGP routing table entry for
[6][172.16.254.6:102][0][32][192.168.104.13][32][239.1.1.2][32][172.16.254.6]/27, version
90
Paths: (1 available, best #1, table evi_102)
Advertised to update-groups:
1
Refresh Epoch 1
Local
:: (via default) from 0.0.0.0 (172.16.255.6)
Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
IGMP/MLD v3
Extended Community: RT:65001:102 ENCAP:8
Local irb vxlan vtep:
vrf:not found, l3-vni:0
local router mac:0000.0000.0000
core-irb interface:(not found)
vtep-ip:172.16.254.6
rx pathid: 0, tx pathid: 0x0
Updated on May 6 2022 12:25:57 UTC

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

## Outputs to Verify Configuration on the External Device

### Verify IGMPv2

```

EXT# show ip igmp groups 239.1.1.1IGMP Connected Group Membership
Group Address Interface Uptime Expires Last Reporter Group Accounted
239.1.1.1 BDI103 00:34:05 00:02:59 192.168.103.13

```

```

EXT# show ip pim rp mapping
PIM Group-to-RP Mappings

```

```
Group(s): 224.0.0.0/4, Static
RP: 192.168.255.255 (?)
```

```
EXT# show ip mroute 239.1.1.1
```

```
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
```

```
Timers: Uptime/Expires
```

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

```
(* , 239.1.1.1), 03:22:07/00:02:45, RP 192.168.255.255, flags: SJCF
```

```
Incoming interface: Null, RPF nbr 0.0.0.0
```

```
Outgoing interface list:
```

```
BDI103, Forward/Sparse, 00:34:20/00:02:43, flags:
```

```
GigabitEthernet0/0/0, Forward/Sparse, 03:22:07/00:02:45, flags:
```

```
(192.168.103.13, 239.1.1.1), 00:34:46/00:03:24, flags: FT
```

```
Incoming interface: BDI103, RPF nbr 0.0.0.0
```

```
Outgoing interface list:
```

```
GigabitEthernet0/0/0, Forward/Sparse, 00:34:20/00:03:16, flags:
```

```
(10.1.101.11, 239.1.1.1), 02:13:13/00:02:10, flags: T
```

```
Incoming interface: GigabitEthernet0/0/0, RPF nbr 192.168.1.1
```

```
Outgoing interface list:
```

```
BDI103, Forward/Sparse, 00:34:20/00:02:43, flags:
```

## Verify IGMPv3

```
EXT# show ip igmp groups 239.1.1.2
```

```
IGMP Connected Group Membership
```

Group Address	Interface	Uptime	Expires	Last Reporter	Group Accounted
239.1.1.2	BDI104	00:20:51	stopped	192.168.104.13	

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

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

```
RP: 192.168.255.255 (?)
```

```
EXT# show ip mroute 239.1.1.2
```

```
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, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
                          t - LISP transit group

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(192.168.104.13, 239.1.1.2), 00:19:53/00:03:14, flags: sT
  Incoming interface: BDI104, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet0/0/0, Forward/Sparse, 00:13:40/00:03:14, flags:

(10.1.102.11, 239.1.1.2), 00:20:34/00:02:20, flags: sTI
  Incoming interface: GigabitEthernet0/0/0, RPF nbr 192.168.1.1
  Outgoing interface list:
    BDI104, Forward/Sparse, 00:13:40/00:02:20, flags:

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

## Outputs to Verify Configuration on Spine Switch 1

### Verify IGMPv2

```

Spine-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 144, main routing table version 144
34 network entries using 13056 bytes of memory
65 path entries using 14560 bytes of memory
15/14 BGP path/bestpath attribute entries using 4440 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
12 BGP extended community entries using 484 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 32660 total bytes of memory
BGP activity 55/21 prefixes, 141/76 paths, scan interval 60 secs
35 networks peaked at 13:38:38 May 6 2022 UTC (02:54:38.599 ago)

Neighbor          V      AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.2      4      65001   498    499     144    0    0 06:11:11      31
172.16.255.3      4      65001   426    499     144    0    0 06:11:24       6
172.16.255.4      4      65001   433    498     144    0    0 06:11:23      19
172.16.255.6      4      65001   437    498     144    0    0 06:11:26       9

```

### Verify IGMPv3

```

Spine-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 144, main routing table version 144

```

```

34 network entries using 13056 bytes of memory
65 path entries using 14560 bytes of memory
15/14 BGP path/bestpath attribute entries using 4440 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
12 BGP extended community entries using 484 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 32660 total bytes of memory
BGP activity 56/22 prefixes, 143/78 paths, scan interval 60 secs
35 networks peaked at 13:38:38 May 6 2022 UTC (03:30:10.672 ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.2	4	65001	538	538	144	0	0	06:46:43	31
172.16.255.3	4	65001	464	538	144	0	0	06:46:56	6
172.16.255.4	4	65001	474	537	144	0	0	06:46:55	19
172.16.255.6	4	65001	475	537	144	0	0	06:46:58	9

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

## Outputs to Verify Configuration on Spine Switch 2

### Verify IGMPv2

```

Spine-02# show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 144, main routing table version 144
34 network entries using 13056 bytes of memory
65 path entries using 14560 bytes of memory
15/14 BGP path/bestpath attribute entries using 4440 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
12 BGP extended community entries using 484 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 32660 total bytes of memory
BGP activity 53/19 prefixes, 141/76 paths, scan interval 60 secs
35 networks peaked at 13:38:38 May 6 2022 UTC (02:55:51.914 ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	501	499	144	0	0	06:12:24	31
172.16.255.3	4	65001	429	500	144	0	0	06:12:20	6
172.16.255.4	4	65001	434	500	144	0	0	06:12:20	19
172.16.255.6	4	65001	442	500	144	0	0	06:12:23	9

### Verify IGMPv3

```

Spine-02#show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 144, main routing table version 144
34 network entries using 13056 bytes of memory
65 path entries using 14560 bytes of memory
15/14 BGP path/bestpath attribute entries using 4440 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
12 BGP extended community entries using 484 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 32660 total bytes of memory

```



BGP activity 55/21 prefixes, 143/78 paths, scan interval 60 secs  
 35 networks peaked at 13:38:38 May 6 2022 UTC (03:30:25.802 ago)

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	539	538	144	0	0	06:46:58	31
172.16.255.3	4	65001	467	538	144	0	0	06:46:54	6
172.16.255.4	4	65001	474	537	144	0	0	06:46:54	19
172.16.255.6	4	65001	480	538	144	0	0	06:46:57	9

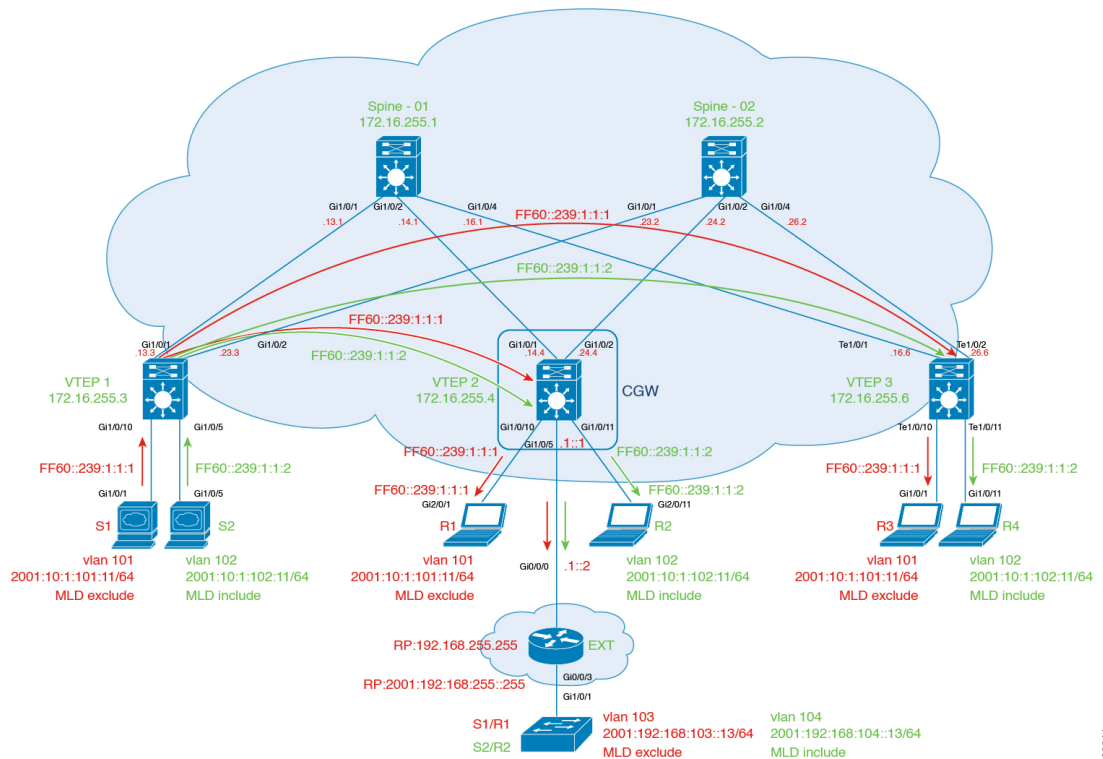
To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

## Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6

This example shows how to configure Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 traffic in an EVPN VXLAN fabric that has ingress replication enabled in the underlay and multicast traffic is handedoff to an external network.

For IPv4 multicast traffic, refer [Figure 8: Topology Showing Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 Traffic](#).

**Figure 9: Topology for Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv6 Traffic**



The topology shows an EVPN VXLAN fabric, with two spine switches and three VTEPs, connected to an external network. Multicast traffic source is located in Layer 2 VTEP 1 and receivers are located in Layer 2 VTEP 3, the Centralized Gateway, and also located in the external network. Centralized gateway (CGW) is

**Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6**

configured on VTEP 2. VLAN 101 has IGMPv2 and MLD enabled and VLAN 102 has IGMPv3 and MLD enabled. Rendezvous Point (RP) is located outside the EVPN VXLAN fabric. The following tables provide sample configurations for the devices in this topology:

*Table 11: Configure VTEP1, CGW, and VTEP3*

VTEP1	CGW	VTEP3
-------	-----	-------

## Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6

VTEP1	CGW	VTEP3
<pre>Leaf-01#show running-config hostname Leaf-01 ! ip routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.3 ip igmp snooping querier ! ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping ! l2vpn evpn replication-type ingress router-id Loopback1 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/5</pre>	<pre>Leaf-02#show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 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 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 vrf green ! ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping ipv6 multicast-routing vrf green ! l2vpn evpn replication-type ingress router-id Loopback1 default-gateway advertise multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip ospf 1 area 0 !</pre>	<pre>Leaf-03#show running-config hostname Leaf-03 ! ip routing ! ip igmp snooping querier version 3 ip igmp snooping querier address 172.16.254.6 ip igmp snooping querier ! ipv6 unicast-routing ipv6 mld snooping querier version 2 ipv6 mld snooping querier ipv6 mld snooping ! l2vpn evpn replication-type ingress router-id Loopback1 multicast advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0</pre>

VTEP1	CGW	VTEP3
<pre> switchport access vlan 102 switchport mode access ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>	<pre> interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 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 ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/5 no switchport mtu 1500 vrf forwarding green ip address 192.168.1.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ipv6 address 2001:192:168:1::1/64 ospfv3 2 network point-to-point ospfv3 2 ipv6 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface GigabitEthernet1/0/11 switchport access vlan 102 switchport mode access spanning-tree portfast ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address 2001:10:1:101::1/64 ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ip igmp version 3 ipv6 address 2001:10:1:102::1/64 ! </pre>	<pre> ! interface TenGigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface TenGigabitEthernet1/0/11 switchport access vlan 102 switchport mode access ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! 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 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 ! end </pre>

## Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6

VTEP1	CGW	VTEP3
	<pre> interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 ingress-replication member vni 10102 ingress-replication ! router ospfv3 2 ! address-family ipv6 unicast vrf green redistribute connected redistribute bgp 65001 exit-address-family ! router ospf 2 vrf green redistribute connected redistribute bgp 65001 ! 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 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 static redistribute connected redistribute ospf 2 match internal external 1 external 2 exit-address-family ! ip pim vrf green rp-address 192.168.255.255 ! ipv6 pim vrf green rp-address 2001:192:168:255::255 </pre>	

VTEP1	CGW	VTEP3
	! end	

Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6

Table 12: Configure Spine Switch 1, Spine Switch 2, and External Device

Spine Switch 1	Spine Switch 2	External Device
----------------	----------------	-----------------



Spine Switch 1	Spine Switch 2	External Device
<pre> Spine-01#show running-config hostname Spine-01 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 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 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 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 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 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                     </pre>	<pre> Spine-02#show running-config hostname Spine-02 ! ip routing ! 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 GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 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 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 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 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 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                     </pre>	<pre> EXT1#show running-config hostname EXT ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! bridge-domain 103 bridge-domain 104 ! interface Loopback255 ip address 192.168.255.255 255.255.255.255 ip pim sparse-mode ip ospf 2 area 0 ipv6 address 2001:192:168:255::255/128 ipv6 ospf 2 area 0 ! interface GigabitEthernet0/0/0 ip address 192.168.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 negotiation auto ipv6 address 2001:192:168:1::2/64 ipv6 ospf 2 area 0 ipv6 ospf network point-to-point ! interface GigabitEthernet0/0/3 no ip address negotiation auto service instance 103 ethernet encapsulation dot1q 103 rewrite ingress tag pop 1 symmetric bridge-domain 103 ! service instance 104 ethernet encapsulation dot1q 104 rewrite ingress tag pop 1 symmetric bridge-domain 104 ! ! interface BDI103 ip address 192.168.103.1 255.255.255.0 ip pim sparse-mode ip ospf 2 area 0 ipv6 address 2001:192:168:103::1/64 ipv6 ospf 2 area 0 ! interface BDI104 ip address 192.168.104.1 255.255.255.0                     </pre>

Spine Switch 1	Spine Switch 2	External Device
<pre> ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both 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 ! end </pre>	<pre> ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both 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 ! end </pre>	<pre> ip pim sparse-mode ip igmp static-group 239.1.1.2 source 10.1.102.11 ip igmp version 3 ip ospf 2 area 0 ipv6 address 2001:192:168:104::1/64 ipv6 ospf 2 area 0 ! router ospfv3 2 ! address-family ipv6 unicast passive-interface BDI103 passive-interface BDI104 passive-interface Loopback255 exit-address-family ! router ospf 2 passive-interface BDI103 passive-interface BDI104 ! ip pim rp-address 192.168.255.255 ip pim ssm range SSM ! ip access-list standard SSM 10 permit 239.1.1.2 ! ipv6 pim rp-address 2001:192:168:255::255 ! end </pre>

To return, click [Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#), on page 137.

To return to the Configuration Examples section, click [Configuration Examples for Optimized Layer 2 Overlay Multicast](#), on page 10.

## Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6

The following sections provide sample output of **show** commands to verify Optimized Layer 2 Overlay Multicast configuration for IPv4 and IPv6 multicast traffic handoff to an external network, on the devices in the [Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#).

To see the output of **show** commands for IPv4 multicast traffic, go to [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4](#).

The output of **show** commands for IPv6 multicast traffic are provided in the following sections.

[Outputs to Verify Configuration on VTEP1](#)

[Outputs to Verify Configuration on CGW](#)

[Outputs to Verify Configuration on VTEP3](#)

[Outputs to Verify Configuration on Spine Switch 1](#)

Outputs to Verify Configuration on Spine Switch 2

Outputs to Verify Configuration on External Device

Outputs to Verify Configuration on VTEP1

```
Leaf-01# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address      EVI   VLAN  MAC Address      Source
-----
Y   10.1.101.1                    101   101   7c21.0dbd.9541   172.16.254.4
Y   2001:10:1:101::1              101   101   7c21.0dbd.9541   172.16.254.4
```

```
Leaf-01# show ipv6 mld snooping querier vlan 101 IP address :
FE80:0:7155:0:12B3:D5FF:FE6A:8F80
MLD version          : v2
Port                 : Switch
Max response time    : 10s
Query interval       : 125s
Robustness variable  : 2
```

```
Leaf-01# show ipv6 mld snooping membership vlan 101
Snooping Membership Summary for Vlan 101
-----
Total number of channels: 1
Total number of hosts   : 2

Source/Group                Interface Reporter                Vlan Uptime
Last-Join/                                     Last-Leave
-----
::/FF06::239:1:1:1          Tu0      FE80::AC10:FE04                101  20:58:46
20:58:46 /
-
::/FF06::239:1:1:1          Tu0      FE80::AC10:FE06                101  20:48:20
20:48:20 /
```

```
Leaf-01# show l2vpn evpn evi 101 detail
EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.3:101 (auto)
Import-RTs:        65001:101
Export-RTs:        65001:101
Per-EVI Label:     none
State:             Established
Replication Type:  Ingress (global)
Encapsulation:     vxlan
IP Local Learn:    Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5: Disabled
Adv. Multicast:    Enabled (global)
Vlan:              101
Protected:         False
Ethernet-Tag:      0
State:             Established
Flood Suppress:   Attached
Core If:
```

```

Access If:
NVE If:      nve1
RMAC:       0000.0000.0000
Core Vlan:  0
L2 VNI:     10101
L3 VNI:     0
VTEP IP:    172.16.254.3
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD

```

```

Leaf-01# show l2vpn evpn multicast local address FF06::239:1:1:1EVI  VLAN  Interface
Version  Filter  (Source, Group)
-----

```

```

Leaf-01# show l2vpn evpn multicast remote address FF06::239:1:1:1
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----
101  101    172.16.254.4        MLDv2   EXCLUDE (*, FF06::239:1:1:1)
101  101    172.16.254.6        MLDv2   EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-01# show l2route evpn multicast routes group FF06::239:1:1:1EVI  ETAG      Group
Source                                     Next-hop(s)
-----

```

```

101  0      FF06::239:1:1:1      ::
      V:10101 172.16.254.4, Gi1/0/10:101, V:10101 172.16.254.6

```

```

Leaf-01# show l2route evpn multicast smet group FF06::239:1:1:1EVI  ETAG      Origin
Group                                     Filter      Source(s)
-----

```

```

101  0      172.16.254.4        FF06::239:1:1:1      EXCLUDE
(*)MLDv2
101  0      172.16.254.6        FF06::239:1:1:1      EXCLUDE
(*)MLDv2

```

```

Leaf-01# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4
BGP routing table entry for
[6][172.16.254.3:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 655
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35 (global)
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 9 2022 16:09:15 UTC
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 653
Paths: (2 available, best #2, table EVPN-BGP-Table)

```

```

Not advertised to any peer
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
    Origin incomplete, metric 0, localpref 100, valid, internal
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.4, Cluster list: 172.16.255.2
    rx pathid: 0, tx pathid: 0
    Updated on May 9 2022 16:09:15 UTC
Refresh Epoch 2
Local
  172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.4, Cluster list: 172.16.255.1
    rx pathid: 0, tx pathid: 0x0
    Updated on May 9 2022 16:09:15 UTC

Leaf-01# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6 BGP routing table
entry for [6][172.16.254.3:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version
690
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35 (global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.6, Cluster list: 172.16.255.1
    rx pathid: 0, tx pathid: 0x0
    Updated on May 9 2022 16:19:41 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 688
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 2
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on May 9 2022 16:19:41 UTC
  Refresh Epoch 2
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on May 9 2022 16:19:41 UTC

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6, on page 146.](#)

## Outputs to Verify Configuration on CGW

```
Leaf-02# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address          EVI   VLAN  MAC Address   Source
-----
Y   10.1.101.1                          101   101   7c21.0dbd.9541 V1101
Y   2001:10:1:101::1                    101   101   7c21.0dbd.9541 V1101
```

```
Leaf-02# show ipv6 mld snooping querier vlan 101
IP address          : FE80::46D3:CAFF:FE28:6CC1
MLD version         : v2
Port                : Gi1/0/10
Max response time   : 10s
Query interval      : 125s
Robustness variable : 2
```

```
Leaf-02# show ipv6 mld snooping membership vlan 101 Snooping Membership Summary for Vlan 101
```

```
-----
Total number of channels: 1
Total number of hosts   : 2

Source/Group          Interface Reporter          Vlan Uptime
Last-Join/                               Last-Leave
-----
::/FF06::239:1:1:1   Gi1/0/10 FE80::46D3:CAFF:FE28:6CC1   101 00:00:00
00:01:28 /                                               00:01:28

::/FF06::239:1:1:1   Tu0       FE80::AC10:FE06             101 20:52:37
20:52:37 /                                               -
```

```
Leaf-02# show l2vpn evpn evi 101 detail
EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.4:101 (auto)
Import-RTs:        65001:101
Export-RTs:        65001:101
Per-EVI Label:     none
State:              Established
Replication Type:   Ingress (global)
Encapsulation:     vxlan
IP Local Learn:    Enabled (global)
Adv. Def. Gateway: Enabled (global)
Re-originate RT5:  Disabled
Adv. Multicast:    Enabled (global)
Vlan:              101
  Protected:       False
  Ethernet-Tag:    0
  State:           Established
  Flood Suppress:  Attached
Core If:
Access If:         Vlan101
NVE If:            nve1
RMAC:              0000.0000.0000
Core Vlan:         0
L2 VNI:            10101
L3 VNI:            0
VTEP IP:           172.16.254.4
VRF:
```

```

IPv4 IRB:          Enabled (Asymmetric)
IPv6 IRB:          Enabled (Asymmetric)
Pseudoports:
  GigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.6
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD

```

```

Leaf-02# show l2vpn evpn multicast local address FF06::239:1:1:1
EVI  VLAN  Interface          Version  Filter  (Source, Group)
-----
101  101    Gi1/0/10           MLDv2   EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-02# show l2vpn evpn multicast remote address FF06::239:1:1:1
EVI  VLAN  Originator          Version  Filter  (Source, Group)
-----
101  101    172.16.254.6       MLDv2   EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-02# show l2route evpn multicast routes group FF06::239:1:1:1EVI  ETAG      Group
Source          Next-hop(s)
-----
101  0          FF06::239:1:1:1   ::
      Gi1/0/10:101, V:10101 172.16.254.3, V:10101 172.16.254.6

```

```

Leaf-02# show l2route evpn multicast smet group FF06::239:1:1:1
EVI  ETAG      Origin          Group          Filter
Source(s)
-----
101  0          Gi1/0/10:101   FF06::239:1:1:1  EXCLUDE
(*)MLDv2
101  0          172.16.254.6   FF06::239:1:1:1  EXCLUDE
(*)MLDv2

```

```

Leaf-02# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4
BGP routing table
entry for [6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version
471

```

```

Paths: (1 available, best #1, table evi_101)

```

```

  Advertised to update-groups:

```

```

    2

```

```

  Refresh Epoch 1

```

```

  Local

```

```

    :: (via default) from 0.0.0.0 (172.16.255.4)

```

```

    Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
    IGMP/MLD v2, exclude

```

```

    Extended Community: RT:65001:101 ENCAP:8

```

```

    Local irb vxlan vtep:

```

```

      vrf:not found, l3-vni:0

```

```

      local router mac:0000.0000.0000

```

```

      core-irb interface:(not found)

```

```

      vtep-ip:172.16.254.4

```

```

    rx pathid: 0, tx pathid: 0x0

```

```

    Updated on May 9 2022 16:09:15 UTC

```

```

Leaf-02# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 513
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35 (global)
  172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    IGMP/MLD v2, exclude
    Extended Community: RT:65001:101 ENCAP:8
    Originator: 172.16.255.6, Cluster list: 172.16.255.1
    rx pathid: 0, tx pathid: 0x0
    Updated on May 9 2022 16:19:41 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version 511
Paths: (2 available, best #2, table EVPN-BGP-Table)
  Not advertised to any peer
  Refresh Epoch 2
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
      Origin incomplete, metric 0, localpref 100, valid, internal
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.2
      rx pathid: 0, tx pathid: 0
      Updated on May 9 2022 16:19:41 UTC
  Refresh Epoch 2
  Local
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      IGMP/MLD v2, exclude
      Extended Community: RT:65001:101 ENCAP:8
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on May 9 2022 16:19:41 UTC

Leaf-02# show ipv6 mroute vrf green FF06::239:1:1:1
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::239:1:1:1), 21:03:04/never, RP 2001:192:168:255::255, flags: SCJ
  Incoming interface: GigabitEthernet1/0/5
  RPF nbr: FE80::A2B4:39FF:FE21:9182
  Immediate Outgoing interface list:
    Vlan101, Forward, 21:03:04/never

(2001:10:1:101::11, FF06::239:1:1:1), 00:05:00/00:02:12, flags: SFJT
  Incoming interface: Vlan101
  RPF nbr: 2001:10:1:101::11
  Immediate Outgoing interface list:
    GigabitEthernet1/0/5, Forward, 00:05:00/00:02:35

```



```
Leaf-02# show ipv6 mld vrf green groups ff06::239:1:1:1 detail
Interface:      Vlan101
Group:          FF06::239:1:1:1
Uptime:         21:03:04
Router mode:    EXCLUDE (Expires: 00:02:49)
Host mode:      INCLUDE
Last reporter:  FE80::7E21:DFF:FEBD:9500
Source list is empty
```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#), on page 146.

### Outputs to Verify Configuration on VTEP3

```
Leaf-03# show l2vpn evpn default-gateway vlan 101
Valid Default Gateway Address      EVI   VLAN  MAC Address      Source
-----
Y   10.1.101.1                      101   101   7c21.0dbd.9541  172.16.254.4
Y   2001:10:1:101::1                101   101   7c21.0dbd.9541  172.16.254.4
```

```
Leaf-03# show ipv6 mld snooping querier vlan 101
IP address      : FE80:0:1C56:0:E75:BDF:FE67:EF00
MLD version    : v2
Port           : Switch
Max response time : 10s
Query interval : 125s
Robustness variable : 2
```

```
Leaf-03# show ipv6 mld snooping membership vlan 101Snooping Membership Summary for Vlan 101
```

```
-----
Total number of channels: 1
Total number of hosts   : 2

Source/Group          Interface Reporter          Vlan Uptime
Last-Join/                               Last-Leave
-----
::/FF06::239:1:1:1   Te1/0/10 FE80::EEE1:A9FF:FE37:92C1  101  00:00:00
00:00:10 /                                               00:00:10

::/FF06::239:1:1:1   Tu0      FE80::AC10:FE04           101  21:05:03
21:05:03 /
```

```
Leaf-03# show l2vpn evpn evi 101 detail
EVPN instance:      101 (VLAN Based)
RD:                 172.16.254.6:101 (auto)
Import-RTs:         65001:101
Export-RTs:         65001:101
Per-EVI Label:      none
State:              Established
Replication Type:   Ingress (global)
```

```

Encapsulation:      vxlan
IP Local Learn:     Enabled (global)
Adv. Def. Gateway: Disabled (global)
Re-originate RT5:  Disabled
Adv. Multicast:    Enabled (global)
Vlan:              101
  Protected:       False
  Ethernet-Tag:    0
  State:           Established
  Flood Suppress:  Attached
Core If:
Access If:
NVE If:            nve1
RMAC:             0000.0000.0000
Core Vlan:        0
L2 VNI:           10101
L3 VNI:           0
VTEP IP:          172.16.254.6
Pseudoports:
  TenGigabitEthernet1/0/10 service instance 101
    Routes: 1 MAC, 2 MAC/IP
Peers:
  172.16.254.3
    Routes: 1 MAC, 2 MAC/IP, 1 IMET, 0 EAD
  172.16.254.4
    Routes: 2 MAC, 4 MAC/IP, 1 IMET, 0 EAD

```

```

Leaf-03# show l2vpn evpn multicast local address FF06::239:1:1:1EVI  VLAN  Interface
Version  Filter  (Source, Group)
-----
101  101  Te1/0/10          MLDv2      EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-03# show l2vpn evpn multicast remote address FF06::239:1:1:1EVI  VLAN  Originator
Version  Filter  (Source, Group)
-----
101  101  172.16.254.4      MLDv2      EXCLUDE (*, FF06::239:1:1:1)

```

```

Leaf-03# show l2route evpn multicast routes group FF06::239:1:1:1
EVI  ETAG  Group                      Source
Next-hop(s)
-----
101  0      FF06::239:1:1:1          ::
      V:10101 172.16.254.4, V:10101 172.16.254.3, Te1/0/10:101

```

```

Leaf-03# show l2route evpn multicast smet group FF06::239:1:1:1
EVI  ETAG  Origin                      Group                      Filter
Source(s)
-----
101  0      Te1/0/10:101              FF06::239:1:1:1          EXCLUDE
(*)MLDv2
101  0      172.16.254.4              FF06::239:1:1:1          EXCLUDE
(*)MLDv2

```

```

Leaf-03# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.4
BGP routing table entry for
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 859
Paths: (2 available, best #2, table EVPN-BGP-Table)
Not advertised to any peer
Refresh Epoch 2

```

```

Local
 172.16.254.4 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
  Origin incomplete, metric 0, localpref 100, valid, internal
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.2
  rx pathid: 0, tx pathid: 0
  Updated on May 9 2022 16:09:15 UTC
Refresh Epoch 2
Local
 172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 9 2022 16:09:15 UTC
BGP routing table entry for
[6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35, version 861
Paths: (1 available, best #1, table evi_101)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from
[6][172.16.254.4:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.4]/35 (global)
 172.16.254.4 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
  Origin incomplete, metric 0, localpref 100, valid, internal, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Originator: 172.16.255.4, Cluster list: 172.16.255.1
  rx pathid: 0, tx pathid: 0x0
  Updated on May 9 2022 16:09:15 UTC

Leaf-03# show bgp l2vpn evpn route-type 6 0 * FF06::239:1:1:1 172.16.254.6
BGP routing table
entry for [6][172.16.254.6:101][0][0][*][128][FF06::239:1:1:1][32][172.16.254.6]/35, version
870
Paths: (1 available, best #1, table evi_101)
  Advertised to update-groups:
    2
  Refresh Epoch 1
  Local
  :: (via default) from 0.0.0.0 (172.16.255.6)
  Origin incomplete, localpref 100, weight 32768, valid, sourced, local, best
  IGMP/MLD v2, exclude
  Extended Community: RT:65001:101 ENCAP:8
  Local irb vxlan vtep:
    vrf: not found, l3-vni: 0
    local router mac: 0000.0000.0000
    core-irb interface: (not found)
    vtep-ip: 172.16.254.6
  rx pathid: 0, tx pathid: 0x0
  Updated on May 9 2022 16:19:41 UTC

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#), on page 146.

### Outputs to Verify Configuration on Spine Switch 1

```

Spine-01# show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 330, main routing table version 330

```

```

41 network entries using 15744 bytes of memory
79 path entries using 17696 bytes of memory
13/12 BGP path/bestpath attribute entries using 3848 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
8 BGP extended community entries using 324 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 37732 total bytes of memory
BGP activity 126/85 prefixes, 384/305 paths, scan interval 60 secs
45 networks peaked at 15:44:30 May 9 2022 UTC (21:34:21.817 ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.2	4	65001	1698	1699	330	0	0	23:12:41	38
172.16.255.3	4	65001	1567	1710	330	0	0	23:12:44	8
172.16.255.4	4	65001	1624	1710	330	0	0	23:12:44	22
172.16.255.6	4	65001	1548	1718	330	0	0	23:12:44	11

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#), on page 146.

### Outputs to Verify Configuration on Spine Switch 2

```

Spine-02# show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 330, main routing table version 330
41 network entries using 15744 bytes of memory
79 path entries using 17696 bytes of memory
13/12 BGP path/bestpath attribute entries using 3848 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
8 BGP extended community entries using 324 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 37732 total bytes of memory
BGP activity 130/89 prefixes, 386/307 paths, scan interval 60 secs
45 networks peaked at 15:44:30 May 9 2022 UTC (21:34:42.736 ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	1699	1698	330	0	0	23:13:02	38
172.16.255.3	4	65001	1566	1709	330	0	0	23:13:02	8
172.16.255.4	4	65001	1621	1707	330	0	0	23:13:02	22
172.16.255.6	4	65001	1554	1712	330	0	0	23:13:02	11

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#), on page 146.

### Outputs to Verify Configuration on External Device

```

EXT# show ipv6 mld groups FF06::239:1:1:1
MLD Connected Group Membership
Group Address                               Interface
  Uptime    Expires
FF06::239:1:1:1                             BDI103
  21:07:51  00:03:45

```

```

EXT# show ipv6 pim group-map FF06::239:1:1:1

```

```

IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: 2001:192:168:255::255
  RPF: Tu4,2001:192:168:255::255 (us)
  Info source: Static
  Uptime: 20:57:37, Groups: 1

EXT# show ipv6 mroute FF06::239:1:1:1
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::239:1:1:1), 21:07:51/00:02:36, RP 2001:192:168:255::255, flags: SCJ
  Incoming interface: Tunnel4
  RPF nbr: 2001:192:168:255::255
  Immediate Outgoing interface list:
    BDI103, Forward, 21:07:51/never
    GigabitEthernet0/0/0, Forward, 20:57:13/00:02:36

(2001:10:1:101::11, FF06::239:1:1:1), 00:16:12/00:03:00, RP 2001:192:168:255::255, flags:
SRJ
  Incoming interface: Tunnel4
  RPF nbr: 2001:192:168:255::255
  Immediate Outgoing interface list:
    GigabitEthernet0/0/0, Null, 00:16:12/00:02:36
  Inherited Outgoing interface list:
    BDI103, Forward, 21:07:51/never

(2001:10:1:101::11, FF06::239:1:1:1), 00:16:12/00:03:00, flags: SJT
  Incoming interface: GigabitEthernet0/0/0
  RPF nbr: FE80::7E21:DFF:FEBD:9564
  Inherited Outgoing interface list:
    BDI103, Forward, 21:07:51/never

```

To return, click [Verifying Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6](#), on page 146.

