Configuring Optimized Layer 2 Overlay Multicast

- Restrictions for Optimized Layer 2 Overlay Multicast, on page 1
- Information About Optimized Layer 2 Overlay Multicast, on page 1
- How to Configure Optimized Layer 2 Overlay Multicast, on page 5
- Verifying Optimized Layer 2 Overlay Multicast on VTEP and Centralized Gateway, on page 9
- Configuration Examples for Optimized Layer 2 Overlay Multicast, on page 10

Restrictions for Optimized Layer 2 Overlay Multicast

- This feature does not support data MDT in the underlay.
- Optimized Layer 2 overlay multicast source specific 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 Centralized Gateway that extends the bridge-domain over 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 IGMP or MLD Proxy for EVPN, as defined in draft-ietf-bess-evpn-igmp-mld-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.

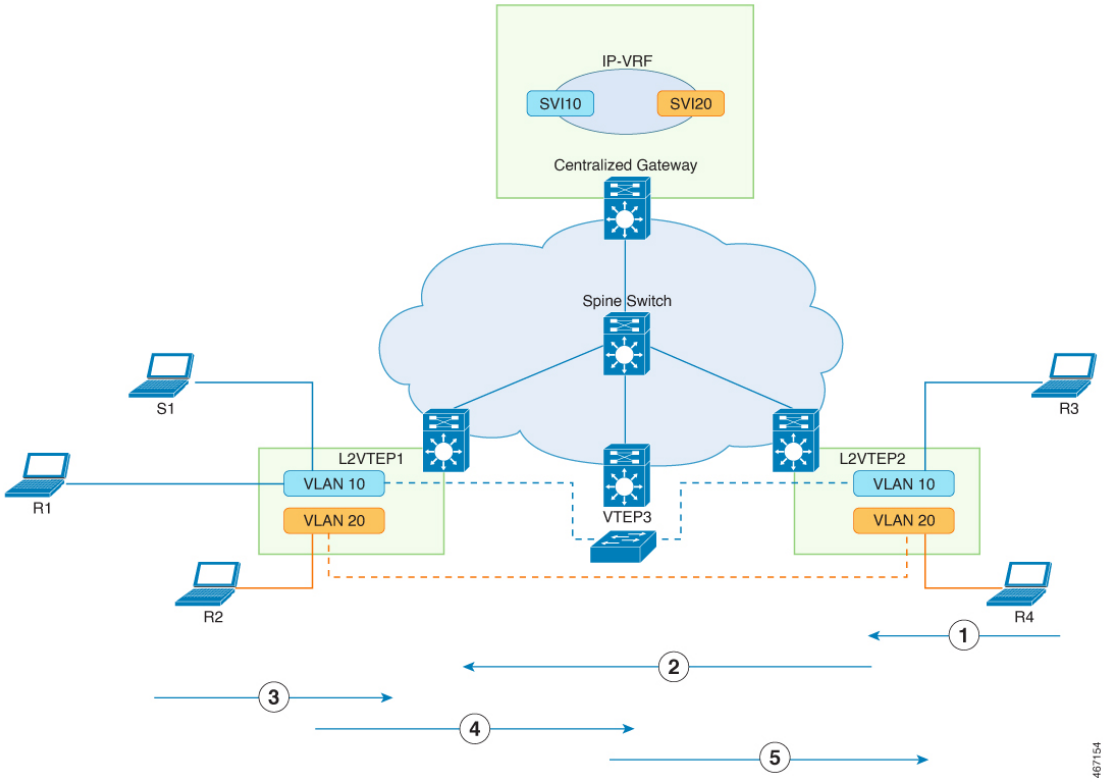
Optimized Layer 2 Overlay Multicast supports both IPv4 and IPv6 multicast traffic in a Layer 2 EVPN VXLAN fabric.

Optimized Layer 2 Multicast in BGP EVPN VXLAN Layer 2 Overlay

Optimized Layer 2 Overlay Multicast uses an EVPN instance (EVI) 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 EVI, 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 to show 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.

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

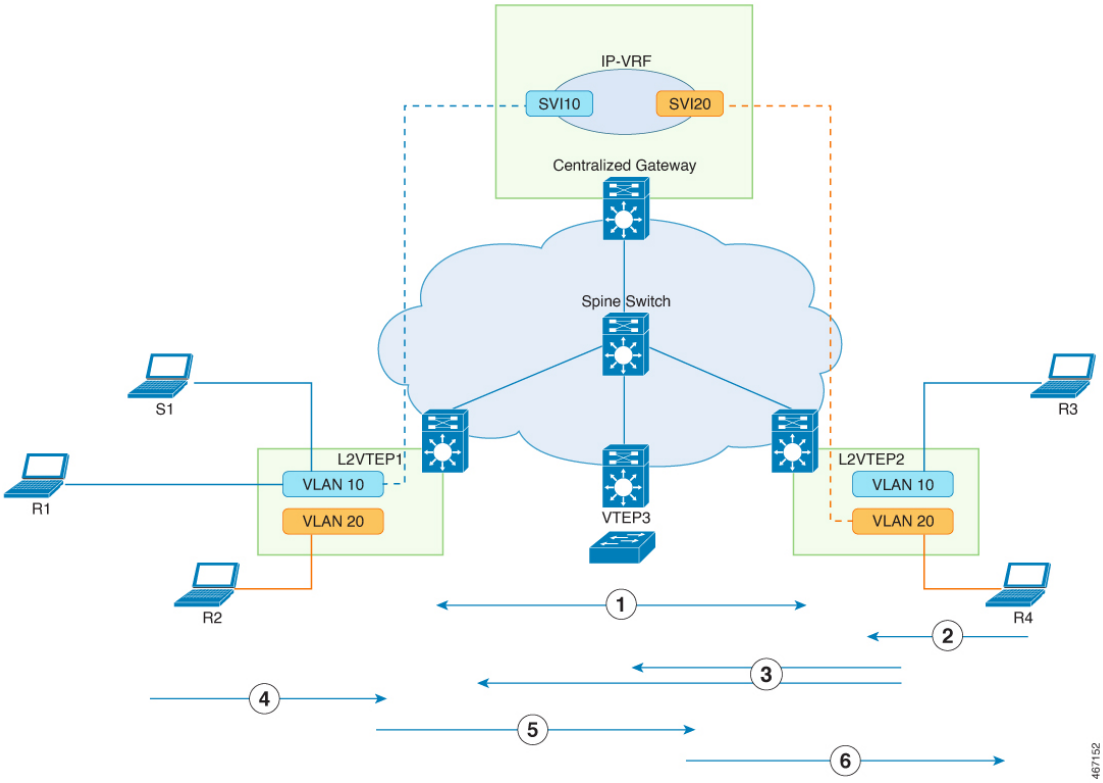
VTEPs in the EVPN VXLAN network forward traffic to each other through the VXLAN gateways. An EVPN VXLAN Centralized Gateway (CGW) VTEP performs the Layer 3 gateway function for all the Layer 2 VNIs. All the other VTEPs in the network perform only bridging. For information on CGW, see “Configuring EVPN 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, both could be on the same VTEP or they could be on different VTEPs within the EVPN VXLAN fabric.

Source and Receiver on Different VLANs, connected to Different Layer 2 VTEPs

Figure 2: Topology to show Layer 2 Overlay Multicast Traffic between Different VLANs

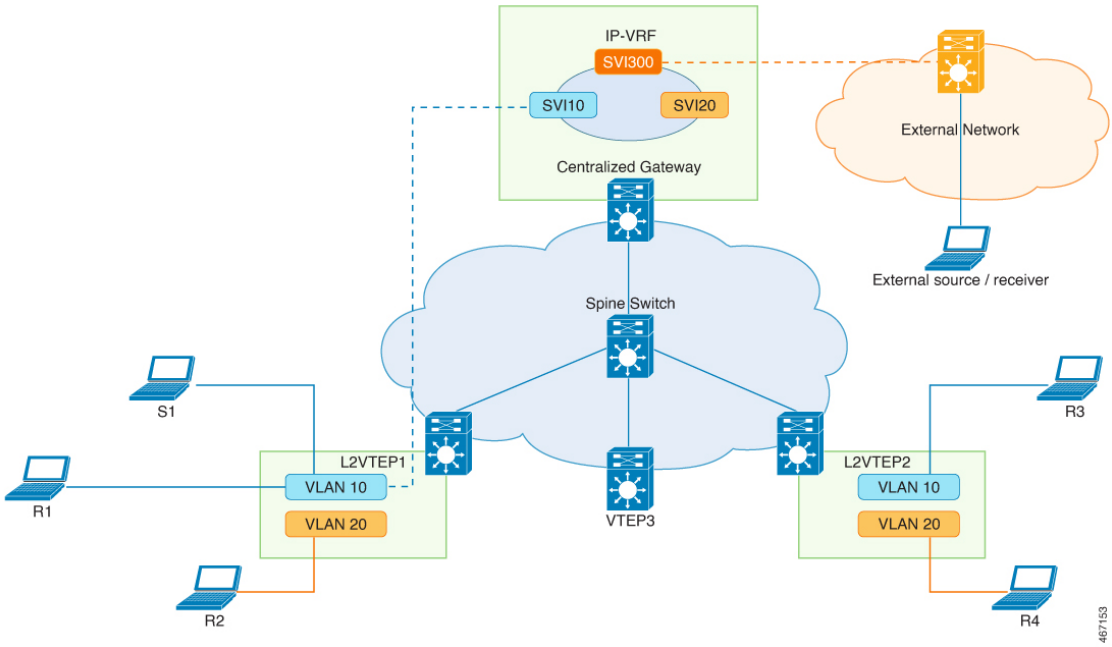


1. CGW sends EVPN route type 6 (*, *) to all the Layer 2 VTEPs in EVPN VXLAN fabric.
2. Receiver R4 in VLAN 20 sends (*, G) IGMP join to VTEP 2. (*, G) is created in IGMP snooping table on VTEP 2.
3. VTEP 2 sends EVPN route type 6 (*, G) to the CGW and all other Layer 2 VTEPs. (* , G) is also created 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 to show 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 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 multidestination Layer 2 overlay broadcast, unknown unicast, and multicast (BUM) traffic. For more information, see Ingress Replication in the "Configuring EVPN VXLAN Layer 2 Overlay Network" chapter. 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 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 in the "Configuring EVPN VXLAN Layer 2 Overlay Network" chapter. 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

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

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**l2vpn evpn** **Example:** `Device(config)# l2vpn evpn`	Enters EVPN configuration mode.
Step 4	**multicast advertise** **Example:** `Device(config-evpn)# multicast advertise`	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 **multicast advertise** { **enable** | **disable** } command in the evpn-evi configuration mode. Example: `Device(config-evpn-evi)# multicast advertise disable`
Step 5	**end** **Example:** `Device(config-evpn)# end`	Returns to privileged EXEC mode.

Configure Optimized Layer 2 Overlay Multicast for IPv4

In addition to the Prerequisites for Configuring Optimized Layer 2 Overlay Multicast, perform the following steps to configure Optimized Layer 2 Overlay Multicast on the access devices that have IPv4 endpoints.

Procedure

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

	Command or Action	Purpose
Step 3	**ip igmp snooping querier** **Example:** `Device(config)# ip igmp snooping querier`	Enables the IGMP snooping querier.
Step 4	**ip igmp snooping querier version** *version-num* **Example:** `Device(config)# ip igmp snooping querier version 3`	Configures the IGMP version which the querier feature uses. By default, IGMP version 2 is configured. IGMP version 2 extends IGMP functionality with features such as the IGMP leave process, group-specific queries, and an explicit maximum query response time. IGMP version 3 provides functionality for Basic IGMPv3 Snooping Support (BISS), which includes support for the snooping features and for IGMPv3 membership report messages.

Step 5	**ip igmp snooping querier** [**max-response-time** *seconds*] [**timer expiry** *seconds*]
	Example:
	`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.
		max-response-time configures a maximum response time for snooping query messages. The range is 1 to 25 seconds.
		timer expiry sets the length of time until the IGMP querier expires. The range is 60 to 300 seconds.

Step 6	**end** **Example:** `Device(config-evpn)# end`	Returns to privileged EXEC mode.

Configure Optimized Layer 2 Overlay Multicast for IPv6

In addition to the Prerequisites for Configuring Optimized Layer 2 Overlay Multicast, perform the following steps to configure Optimized Layer 2 Overlay Multicast on the access devices that support IPv6 endpoints.

Procedure

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

	Command or Action	Purpose
Step 3	**ipv6 mld snooping** **Example:** `Device(config)# ipv6 mld snooping`	Enables the MLD snooping.
Step 4	**ipv6 mld snooping querier** **Example:** `Device(config)# ipv6 mld snooping querier`	Enables the MLD snooping querier.
Step 5	**end** **Example:** `Device(config)# end`	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

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
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	{**ip** | **ipv6**} **multicast-routing**	Enables IP multicast routing.

	Command or Action	Purpose
	Example: `Device(config)# ip multicast-routing`	**Note** If the Centralized Gateway is associated to a VRF, run the **ip multicast-routing vrf** *vrf-name* command.
Step 4	**interface vlan** *vlan-id* **Example:** `Device(config)# interface vlan 20`	Specifies the interface on which you want to enable IP multicast and enters the interface configuration mode.
Step 5	**ip pim sparse-mode** **Example:** `Device(config-if)# ip pim sparse-mode`	Enables IP multicast on the interface.
Step 6	**ip igmp version** *version* **Example:** `Device(config-if)# ip igmp version 3`	Enables IGMP version on this interface. The default version of IGMP is set to Version 2. Repeat Steps 4–6 for all the L2VNIs that have a source or receiver.
Step 7	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 8	{**ip** | **ipv6**} **pim** [**vrf** *vrf-name*] **rp-address** *rp-address* **Example:** `Device(config)# ip pim rp-address 99.99.99.99`	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
show ip igmp snooping	Verify that EVPN IGMP proxy is enabled in IGMP Snooping.
show ip igmp snooping querier	Verify that IGMP Snooping querier version is as expected.
show ip igmp snooping groups	Verify the local and remote multicast group membership in IGMP Snooping.

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

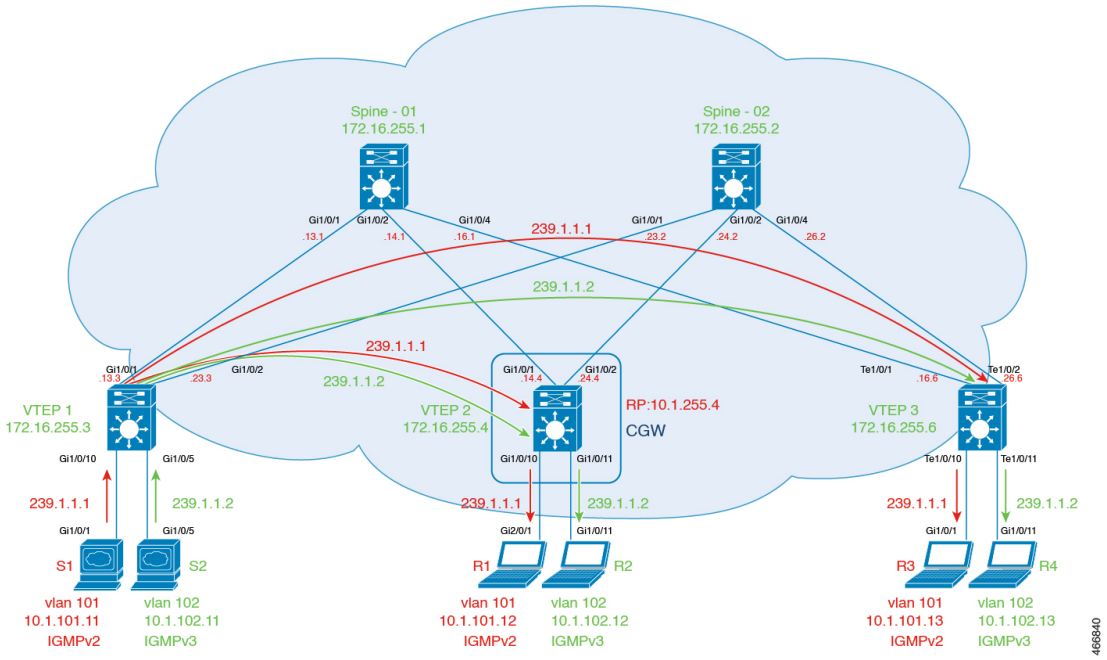
Configuration Examples for Optimized Layer 2 Overlay Multicast

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:

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

VTEP 1	CGW	VTEP 3

VTEP 1	CGW	VTEP 3
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	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	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

VTEP 1	CGW	VTEP 3
!	!	TenGigabitEthernet1/0/11
interface nve1	interface GigabitEthernet1/0/2	switchport access vlan 102
no ip address	no switchport	switchport mode access
source-interface Loopback1	ip address 172.16.24.4	!
host-reachability protocol bgp	255.255.255.0	interface nve1
member vni 10101	ip ospf network point-to-point	no ip address
ingress-replication	ip ospf 1 area 0	source-interface Loopback1
member vni 10102	!	host-reachability protocol bgp
ingress-replication	interface	member vni 10101
!	GigabitEthernet1/0/10	ingress-replication
router ospf 1	switchport access vlan 101	member vni 10102
router-id 172.16.255.3	switchport mode access	ingress-replication
!	!	!
router bgp 65001	interface	router ospf 1
bgp log-neighbor-changes	GigabitEthernet1/0/11	router-id 172.16.255.6
no bgp default ipv4-unicast	switchport access vlan 102	!
neighbor 172.16.255.1	switchport mode access	router bgp 65001
remote-as 65001	spanning-tree portfast	bgp log-neighbor-changes
neighbor 172.16.255.1	!	no bgp default ipv4-unicast
update-source Loopback0	interface Vlan101	neighbor 172.16.255.1
neighbor 172.16.255.2	vrf forwarding green	remote-as 65001
remote-as 65001	ip address 10.1.101.1	neighbor 172.16.255.1
neighbor 172.16.255.2	255.255.255.0	update-source Loopback0
update-source Loopback0	ip pim sparse-mode	neighbor 172.16.255.2
!	!	remote-as 65001
address-family ipv4	interface Vlan102	neighbor 172.16.255.2
exit-address-family	vrf forwarding green	update-source Loopback0
!	ip address 10.1.102.1	!
address-family l2vpn evpn	255.255.255.0	address-family ipv4
neighbor 172.16.255.1 activate	ip pim sparse-mode	exit-address-family
neighbor 172.16.255.1	ip igmp version 3	!
send-community both	!	address-family l2vpn evpn
neighbor 172.16.255.2 activate	interface nve1	neighbor 172.16.255.1 activate
neighbor 172.16.255.2	no ip address	neighbor 172.16.255.1
send-community both	source-interface Loopback1	send-community both
exit-address-family	host-reachability protocol bgp	neighbor 172.16.255.2 activate
!	member vni 10101	neighbor 172.16.255.2
end	ingress-replication	send-community both
	member vni 10102	exit-address-family
	ingress-replication	!
	!	end
	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	

VTEP 1	CGW	VTEP 3
	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	

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
Spine-01#**show running-config**	Spine-02#**show running-config**
hostname Spine-01	hostname Spine-02
!	!
ip routing	ip routing
!	!
interface Loopback0	interface Loopback0
ip address 172.16.255.1 255.255.255.255	ip address 172.16.255.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface Loopback1	interface Loopback1
ip address 172.16.254.1 255.255.255.255	ip address 172.16.254.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/1	interface GigabitEthernet1/0/1
no switchport	no switchport
ip address 172.16.13.1 255.255.255.0	ip address 172.16.23.2 255.255.255.0
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/2	interface GigabitEthernet1/0/2
no switchport	no switchport
ip address 172.16.14.1 255.255.255.0	ip address 172.16.24.2 255.255.255.0
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/4	interface GigabitEthernet1/0/4
no switchport	no switchport
ip address 172.16.16.1 255.255.255.0	ip address 172.16.26.2 255.255.255.0
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
router ospf 1	router ospf 1
router-id 172.16.255.1	router-id 172.16.255.2
!	!
router bgp 65001	router bgp 65001
bgp router-id 172.16.255.1	bgp router-id 172.16.255.2
bgp log-neighbor-changes	bgp log-neighbor-changes
no bgp default ipv4-unicast	no bgp default ipv4-unicast
neighbor 172.16.255.2 remote-as 65001	neighbor 172.16.255.1 remote-as 65001
neighbor 172.16.255.2 update-source Loopback0	neighbor 172.16.255.1 update-source Loopback0
neighbor 172.16.255.3 remote-as 65001	neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0	neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001	neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0	neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001	neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0	neighbor 172.16.255.6 update-source Loopback0
!	!
address-family ipv4	address-family ipv4
exit-address-family	exit-address-family
!	!
address-family l2vpn evpn	address-family l2vpn evpn
neighbor 172.16.255.2 activate	neighbor 172.16.255.1 activate
neighbor 172.16.255.2 send-community both	neighbor 172.16.255.1 send-community both
neighbor 172.16.255.2 route-reflector-client	neighbor 172.16.255.1 route-reflector-client
neighbor 172.16.255.3 activate	neighbor 172.16.255.3 activate
neighbor 172.16.255.3 send-community both	neighbor 172.16.255.3 send-community both
neighbor 172.16.255.3 route-reflector-client	neighbor 172.16.255.3 route-reflector-client
neighbor 172.16.255.4 activate	neighbor 172.16.255.4 activate
neighbor 172.16.255.4 send-community both	neighbor 172.16.255.4 send-community both
neighbor 172.16.255.4 route-reflector-client	neighbor 172.16.255.4 route-reflector-client
neighbor 172.16.255.6 activate	neighbor 172.16.255.6 activate
neighbor 172.16.255.6 send-community both	neighbor 172.16.255.6 send-community both

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

Return to Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication, on page 11

Return to 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 outputs for **show** commands to verify Optimized Layer 2 Overlay Multicast with Ingress Replication on the devices in the topology configured above.

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
```

Return to 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 Vl102


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        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, 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:
```

Return to 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          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, 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   Te1/0/11        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       *               Te1/0/11:102, 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          Te1/0/11:102         239.1.1.2       INCLUDE    10.1.102.11
102    0          172.16.254.4         239.1.1.2       INCLUDE    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 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: 172.16.254.4, 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: 172.16.254.4, 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: 172.16.254.4, 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
```

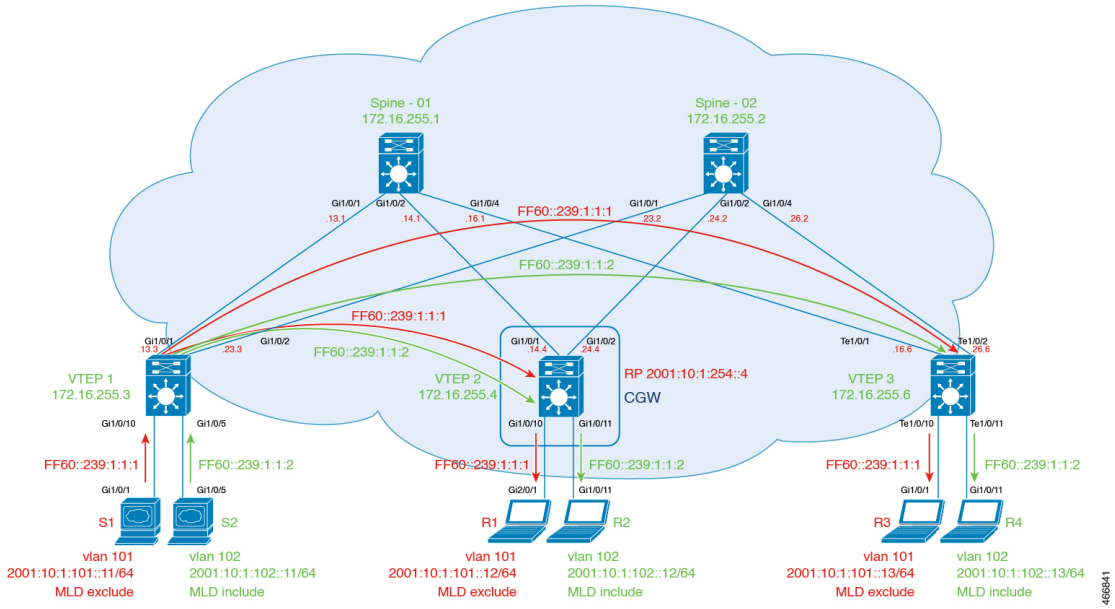
Return to Example 1: Configuring Optimized Layer 2 Overlay Multicast for IPv4 with Ingress Replication

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

VTEP1	CGW	VTEP 3
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 !	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 !	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

VTEP1	CGW	VTEP 3
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	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	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

VTEP1	CGW	VTEP 3
	! 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	

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

Spine Switch 1	Spine Switch 2
Spine-01#**show running-config**	Spine-02#**show running-config**
hostname Spine-01	hostname Spine-02
!	!
ip routing	ip routing
!	!
interface Loopback0	interface Loopback0
ip address 172.16.255.1 255.255.255.255	ip address 172.16.255.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface Loopback1	interface Loopback1
ip address 172.16.254.1 255.255.255.255	ip address 172.16.254.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/1	interface GigabitEthernet1/0/1
no switchport	no switchport
ip address 172.16.13.1 255.255.255.0	ip address 172.16.23.2 255.255.255.0
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/2	interface GigabitEthernet1/0/2
no switchport	no switchport
ip address 172.16.14.1 255.255.255.0	ip address 172.16.24.2 255.255.255.0
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/4	interface GigabitEthernet1/0/4
no switchport	no switchport
ip address 172.16.16.1 255.255.255.0	ip address 172.16.26.2 255.255.255.0
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
router ospf 1	router ospf 1
router-id 172.16.255.1	router-id 172.16.255.2
!	!
router bgp 65001	router bgp 65001
bgp router-id 172.16.255.1	bgp router-id 172.16.255.2
bgp log-neighbor-changes	bgp log-neighbor-changes
no bgp default ipv4-unicast	no bgp default ipv4-unicast
neighbor 172.16.255.2 remote-as 65001	neighbor 172.16.255.1 remote-as 65001
neighbor 172.16.255.2 update-source Loopback0	neighbor 172.16.255.1 update-source Loopback0
neighbor 172.16.255.3 remote-as 65001	neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0	neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001	neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0	neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001	neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0	neighbor 172.16.255.6 update-source Loopback0
!	!
address-family ipv4	address-family ipv4
exit-address-family	exit-address-family
!	!
address-family l2vpn evpn	address-family l2vpn evpn
neighbor 172.16.255.2 activate	neighbor 172.16.255.1 activate
neighbor 172.16.255.2 send-community both	neighbor 172.16.255.1 send-community both
neighbor 172.16.255.2 route-reflector-client	neighbor 172.16.255.1 route-reflector-client
neighbor 172.16.255.3 activate	neighbor 172.16.255.3 activate
neighbor 172.16.255.3 send-community both	neighbor 172.16.255.3 send-community both
neighbor 172.16.255.3 route-reflector-client	neighbor 172.16.255.3 route-reflector-client
neighbor 172.16.255.4 activate	neighbor 172.16.255.4 activate
neighbor 172.16.255.4 send-community both	neighbor 172.16.255.4 send-community both
neighbor 172.16.255.4 route-reflector-client	neighbor 172.16.255.4 route-reflector-client
neighbor 172.16.255.6 activate	neighbor 172.16.255.6 activate
neighbor 172.16.255.6 send-community both	neighbor 172.16.255.6 send-community both

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

Return to Example 2: Configuring Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6, on page 26.

Return to 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 outputs for **show** commands to verify Optimized Layer 2 Overlay Multicast with Ingress Replication on the devices in the topology configured above.

To see the outputs of **show** commands for IPv4 multicast traffic, refer Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication in the Underlay, on page 18

The outputs of **show** commands for IPv6 multicast traffic are the following:

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

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              Tu0       FE80::AC10:FE04                 101  20:14:25
20:14:25 /
                                                                                        -


::/FF06::239:1:1:1              Tu0       FE80::AC10:FE06                 101  20:13:50
20:13:50 /
                                                                                        -


::/FF06:239:1:1::1              Tu0       FE80::AC10:FE04                 101  00:00:48
20:15:23 /
                                                                                 20:14:34


::/FF06:239:1:1::1              Tu0       FE80::AC10:FE06                 101  00:01:11
20:15:10 /
                                                                                 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::239:1:1:1
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)
----- ---------- ---------------------------------------
--------------------------------------- --------------------
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
```

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::239:1:1:2
Source/Group                    Interface Reporter                        Vlan Uptime
Last-Join/
                                                                                Last-Leave
-------------------------------------------------------------------------------------------
```

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


2001:10:1:102::11/FF06::239:1:1:2 \
                                Tu0       FE80::AC10:FE06                 102  00:02:56
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::239:1:1:2
EVI   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 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: 172.16.254.4, 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: 172.16.254.4, 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
```

Return to Verifying Optimized Layer 2 Overlay Multicast with Ingress Replication for IPv4 and IPv6 Traffic, on page 33

Outputs to verify configuration on CGW

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 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: 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
```

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 Vl102


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::239:1:1:2
EVI   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
```

Return to 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:BDFF: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                    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
00:00:57 /
                                                                              00:00:57


::/FF06:239:1:1::1              Te1/0/10  FE80::EEE1:A9FF:FE37:92C1     101  00:01:07
20:25:57 /
                                                                              20:24:49


::/FF06::239:1:1:1              Tu0       FE80::AC10:FE04               101  20:25:16
20:25:16 /
                                                                                    -


::/FF06:239:1:1::1              Tu0       FE80::AC10:FE04               101  00:00:48
20:26:13 /
                                                                              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::239:1:1:1
EVI   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::239:1:1:1
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 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
```

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:BDFF: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 \
                                Te1/0/11  FE80::EEE1:A9FF:FE37:92C2       102  00:11:00
00:00:25 /
                                                                                       -


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::239:1:1:2
EVI   VLAN  Interface       Version   Filter  (Source, Group)
----- ----- --------------- --------- ------- ---------------
102   102   Te1/0/11        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::239:1:1:2
EVI   ETAG       Group                                    Source
       Next-hop(s)
----- ---------- ---------------------------------------
```

```
--------------------------------------- --------------------
102   0          FF06::239:1:1:2                          ::
       V:10102 172.16.254.4, V:10102 172.16.254.3, Te1/0/11:102


Leaf-03# show l2route evpn multicast smet group FF06::239:1:1:2
EVI   ETAG       Origin               Group                                  Filter
Source(s)
----- ---------- -------------------- -------------------------------------- ----------
--------------------
102   0          Te1/0/11:102         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::239:1:1:2 172.16.254.6
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 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
```

Return to 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

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
```

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
```

Return to 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

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 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 (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
```

MLD include

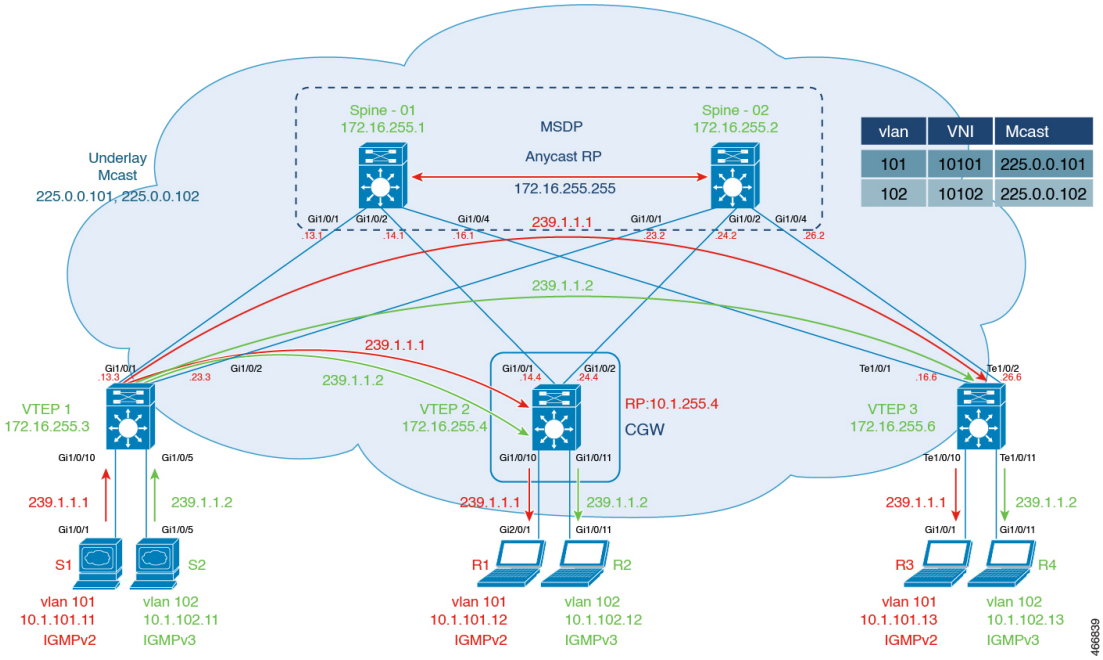
```
Spine-02#show bgp l2vpn evpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 79, main routing table version 79
44 network entries using 16896 bytes of memory
88 path entries using 19712 bytes of memory
11/11 BGP path/bestpath attribute entries using 3256 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
```

Return to 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:

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
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	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 vlan configuration 901 member vni 50901 ! 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	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

VTEP 1	CGW	VTEP 3
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	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	! 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

VTEP 1	CGW	VTEP 3
	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	

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
Spine-01#**show running-config**	Spine-02#**show running-config**
hostname Spine-01	hostname Spine-02
!	!
ip routing	ip routing
!	!
ip multicast-routing	ip multicast-routing
!	!
interface Loopback0	interface Loopback0
ip address 172.16.255.1 255.255.255.255	ip address 172.16.255.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface Loopback1	interface Loopback1
ip address 172.16.254.1 255.255.255.255	ip address 172.16.254.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface Loopback2	interface Loopback2
ip address 172.16.255.255 255.255.255.255	ip address 172.16.255.255 255.255.255.255
ip pim sparse-mode	ip pim sparse-mode
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/1	interface GigabitEthernet1/0/1
no switchport	no switchport
ip address 172.16.13.1 255.255.255.0	ip address 172.16.23.2 255.255.255.0
ip pim sparse-mode	ip pim sparse-mode
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/2	interface GigabitEthernet1/0/2
no switchport	no switchport
ip address 172.16.14.1 255.255.255.0	ip address 172.16.24.2 255.255.255.0
ip pim sparse-mode	ip pim sparse-mode
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/4	interface GigabitEthernet1/0/4
no switchport	no switchport
ip address 172.16.16.1 255.255.255.0	ip address 172.16.26.2 255.255.255.0
ip pim sparse-mode	ip pim sparse-mode
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
router ospf 1	router ospf 1
router-id 172.16.255.1	router-id 172.16.255.2
!	!
router bgp 65001	router bgp 65001
bgp router-id 172.16.255.1	bgp router-id 172.16.255.2
bgp log-neighbor-changes	bgp log-neighbor-changes
no bgp default ipv4-unicast	no bgp default ipv4-unicast
neighbor 172.16.255.2 remote-as 65001	neighbor 172.16.255.1 remote-as 65001
neighbor 172.16.255.2 update-source Loopback0	neighbor 172.16.255.1 update-source Loopback0
neighbor 172.16.255.3 remote-as 65001	neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0	neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001	neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0	neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001	neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0	neighbor 172.16.255.6 update-source Loopback0
!	!
address-family ipv4	address-family ipv4
exit-address-family	exit-address-family
!	!
address-family l2vpn evpn	address-family l2vpn evpn
neighbor 172.16.255.2 activate	neighbor 172.16.255.1 activate

Spine Switch 1	Spine Switch 2
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	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

Return to Configuration Example for Optimized Layer 2 Overlay Multicast for IPv4 with Underlay Multicast Replication

Return to 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 outputs for **show** commands to verify the configuration of Optimized Layer 2 Overlay Multicast with Default MDT on the devices in the topology configured above.

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                                                            Prio/Mode
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 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:  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 239.1.1.1
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)
----- ---------- --------------- --------------- --------------------
```

```
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
```

Return to 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                                                            Prio/Mode
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,
       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), 00:21:16/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 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          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, l3-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:
```

Return to 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                                                            Prio/Mode
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 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), 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 101
Vlan      Group                Type        Version     Port List
------------------------------------------------------------------------------
101       239.1.1.1            igmp        v2          Te1/0/10, 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:  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 239.1.1.1
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       *               Te1/0/10:101, V:10101 225.0.0.101


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 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
  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
```

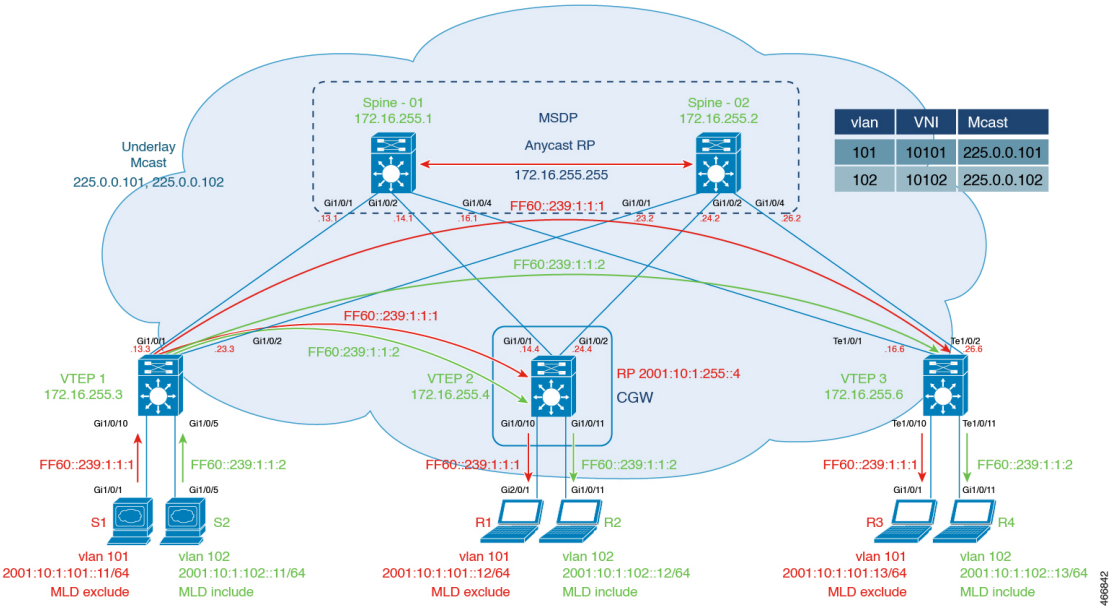
Return to Verifying Optimized Layer 2 Overlay Multicast with Default MDT in the Underlay .

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:

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
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	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	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

VTEP 1	CGW	VTEP 3
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	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	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

VTEP 1	CGW	VTEP 3
	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	

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
Spine-01#**show running-config**	Spine-02#**show running-config**
hostname Spine-01	hostname Spine-02
!	!
ip routing	ip routing
!	!
ip multicast-routing	ip multicast-routing
!	!
interface Loopback0	interface Loopback0
ip address 172.16.255.1 255.255.255.255	ip address 172.16.255.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface Loopback1	interface Loopback1
ip address 172.16.254.1 255.255.255.255	ip address 172.16.254.2 255.255.255.255
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface Loopback2	interface Loopback2
ip address 172.16.255.255 255.255.255.255	ip address 172.16.255.255 255.255.255.255
ip pim sparse-mode	ip pim sparse-mode
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/1	interface GigabitEthernet1/0/1
no switchport	no switchport
ip address 172.16.13.1 255.255.255.0	ip address 172.16.23.2 255.255.255.0
ip pim sparse-mode	ip pim sparse-mode
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/2	interface GigabitEthernet1/0/2
no switchport	no switchport
ip address 172.16.14.1 255.255.255.0	ip address 172.16.24.2 255.255.255.0
ip pim sparse-mode	ip pim sparse-mode
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
interface GigabitEthernet1/0/4	interface GigabitEthernet1/0/4
no switchport	no switchport
ip address 172.16.16.1 255.255.255.0	ip address 172.16.26.2 255.255.255.0
ip pim sparse-mode	ip pim sparse-mode
ip ospf network point-to-point	ip ospf network point-to-point
ip ospf 1 area 0	ip ospf 1 area 0
!	!
router ospf 1	router ospf 1
router-id 172.16.255.1	router-id 172.16.255.2
!	!
router bgp 65001	router bgp 65001
bgp router-id 172.16.255.1	bgp router-id 172.16.255.2
bgp log-neighbor-changes	bgp log-neighbor-changes
no bgp default ipv4-unicast	no bgp default ipv4-unicast
neighbor 172.16.255.2 remote-as 65001	neighbor 172.16.255.1 remote-as 65001
neighbor 172.16.255.2 update-source Loopback0	neighbor 172.16.255.1 update-source Loopback0
neighbor 172.16.255.3 remote-as 65001	neighbor 172.16.255.3 remote-as 65001
neighbor 172.16.255.3 update-source Loopback0	neighbor 172.16.255.3 update-source Loopback0
neighbor 172.16.255.4 remote-as 65001	neighbor 172.16.255.4 remote-as 65001
neighbor 172.16.255.4 update-source Loopback0	neighbor 172.16.255.4 update-source Loopback0
neighbor 172.16.255.6 remote-as 65001	neighbor 172.16.255.6 remote-as 65001
neighbor 172.16.255.6 update-source Loopback0	neighbor 172.16.255.6 update-source Loopback0
!	!
address-family ipv4	address-family ipv4
exit-address-family	exit-address-family
!	!
address-family l2vpn evpn	address-family l2vpn evpn
neighbor 172.16.255.2 activate	neighbor 172.16.255.1 activate

Spine Switch 1	Spine Switch 2
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	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

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

Return to 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 outputs for **show** commands to verify Optimized Layer 2 Overlay Multicast with Default MDT for IPv4 and IPv6 multicast traffic on the devices in the topology configured above.

To see the outputs of **show** commands for IPv4 multicast traffic, refer Verifying Optimized Layer 2 Overlay Multicast with Default MDT in the Underlay , on page 60.

The outputs of **show** commands for IPv6 multicast traffic are the following:

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

MLD exclude

```
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                                                            Prio/Mode
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                    Interface Reporter                        Vlan Uptime
Last-Join/
                                                                                Last-Leave
-------------------------------------------------------------------------------------------

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


::/FF06::239:1:1:1              Tu0       FE80::AC10:FE06                 101  1d00h
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::239:1:1:1 172.16.254.4
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 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
```

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          Interface               Uptime/Expires    Ver   DR
Address                                                           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-Join/
                                                                                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::239:1:1:2
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)
```

```
----- ---------- ---------------------------------------
--------------------------------------- --------------------


Leaf-01# show l2route evpn multicast smet group FF06::239:1:1:2
EVI   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: 172.16.254.4, 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: 172.16.254.4, 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
```

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

Outputs to verify configuration on CGW

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                                                           Prio/Mode
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 225.0.0.101
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 172.16.24.2
  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-Join/
                                                                                  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::239:1:1:1
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 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::239:1:1:1 172.16.254.6
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 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::239:1:1:1
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), 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
```

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                                                           Prio/Mode
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 Vl102
  Y   2001:10:1:102::1                        102   102   7c21.0dbd.954d Vl102
```

```
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  1d00h
00:01:32 /
                                                                                      -
```

```
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::239:1:1:2
EVI   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 225.0.0.102

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 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
```

Return to 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                                                           Prio/Mode
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:BDFF: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::239:1:1:1
EVI   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::239:1:1:1
EVI   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                                                            Prio/Mode
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:BDFF: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 \
                                Te1/0/11  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   Te1/0/11        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::239:1:1:2
EVI   ETAG       Group                                  Source
       Next-hop(s)
----- ---------- ---------------------------------------
--------------------------------------- --------------------
102   0          FF06::239:1:1:2                        ::
       Te1/0/11:102, 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          Te1/0/11:102        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 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          Interface                Uptime/Expires    Ver   DR
Address                                                            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          Interface                Uptime/Expires    Ver   DR
Address                                                            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 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: 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 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    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          Interface                Uptime/Expires    Ver   DR
Address                                                            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          Interface                Uptime/Expires    Ver   DR
Address                                                            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 - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

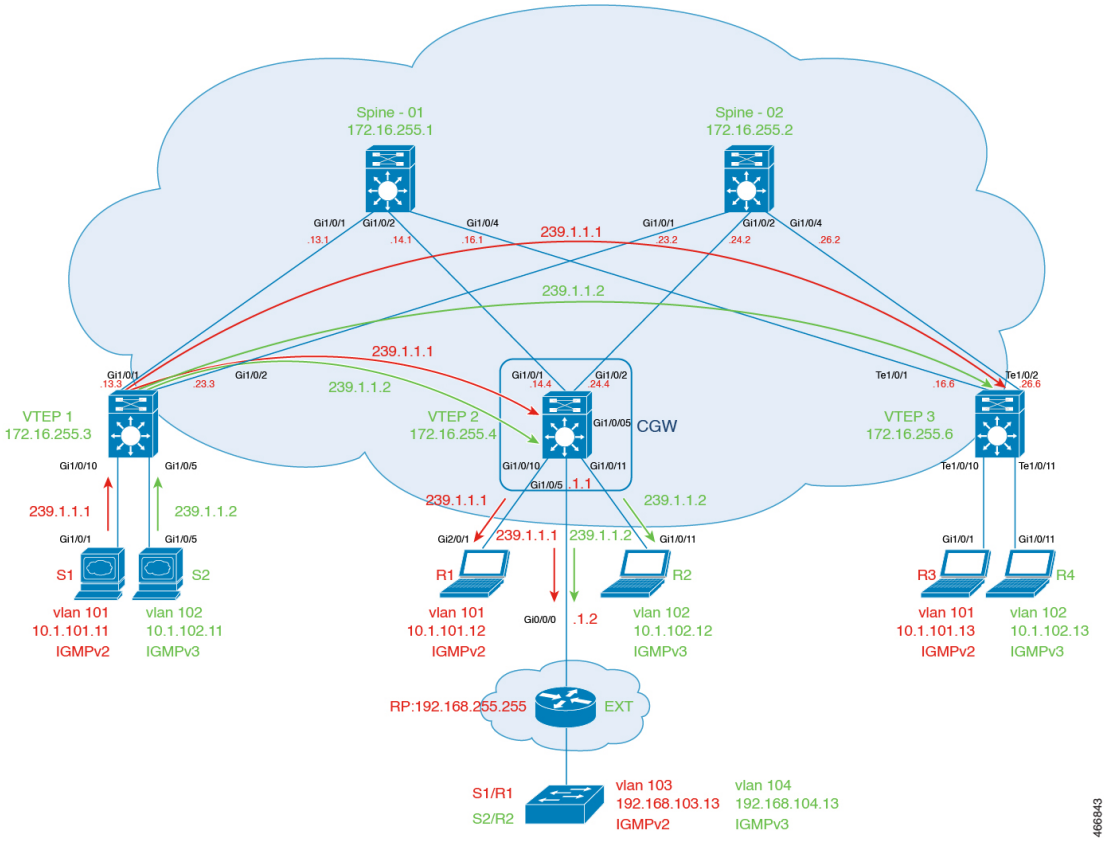
```
                        t - LISP transit group
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 1d00h/00:03:19, 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 handedoff to an external network.

Figure 8: Topology for 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. The source is located in Layer 2 VTEP1 and receivers are located in Layer 2 VTEP 3, the Centralized Gateway, and also located in the external network. Centralized gateway is configured on VTEP 2. VLAN 101 has IGMPv2 and VLAN 102 has IGMPv3 enabled. 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

VTEP1	CGW	VTEP3
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	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	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 !

VTEP1	CGW	VTEP3
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	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	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

VTEP1	CGW	VTEP3
	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	

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

Spine Switch 1	Spine Switch 2	External Device
		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

Spine Switch 1	Spine Switch 2	External Device
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	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	

Spine Switch 1	Spine Switch 2	External Device
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	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	

Return to Example 5: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4, on page 110.

Return to Configuration Examples for Optimized Layer 2 Overlay Multicast, on page 10.

Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

The following sections provide sample outputs for **show** commands to verify Optimized Layer 2 Overlay Multicast configuration for IPv4 multicast traffic handoff to an external network, on the devices in the topology configured above.

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 239.1.1.1
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 172.16.254.4, 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 12:25:57 UTC
```

Return to Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

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          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:  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)
```

```
----- ----- --------------- --------- ------- ---------------
101   101   Gi1/0/10        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       *               Gi1/0/10:101, V:10101 172.16.254.6



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

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 Vl102

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 239.1.1.2
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

(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#!
```

Return to Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

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          Te1/0/10, 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   Te1/0/11        IGMPv2    N/A     (*, 239.1.1.2)
102   102   Te1/0/11        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)
----- ---------- --------------- --------------- --------------------
102   0          239.1.1.2       *               Te1/0/11:102, 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          Te1/0/11:102        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
```

Return to Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

Outputs to verify configuration on the External Device

Verify IGMPv2

```
EXT# show ip igmp groups 239.1.1.1
IGMP 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:
```

Return to Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

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
```

Return to Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

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
```

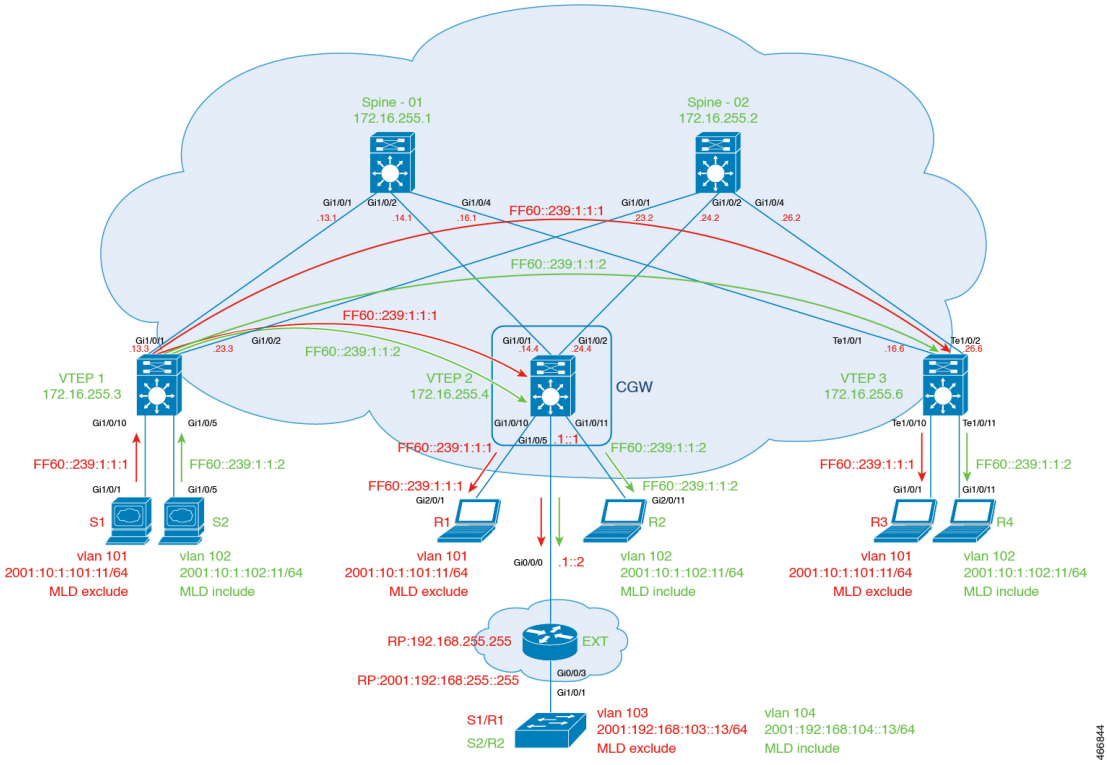
Return to Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

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 for 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 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

VTEP1	CGW	VTEP3
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	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 !	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

VTEP1	CGW	VTEP3
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	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 !	! 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

VTEP1	CGW	VTEP3
	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	

VTEP1	CGW	VTEP3
	! end	

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
Spine-01#**show running-config**	Spine-02#**show running-config**	EXT1#**show running-config**
hostname Spine-01	hostname Spine-02	hostname EXT
!	!	!
ip routing	ip routing	ip multicast-routing
!	!	distributed
interface Loopback0	interface Loopback0	!
ip address 172.16.255.1	ip address 172.16.255.2	ipv6 unicast-routing
255.255.255.255	255.255.255.255	ipv6 multicast-routing
ip ospf 1 area 0	ip ospf 1 area 0	!
!	!	bridge-domain 103
interface Loopback1	interface Loopback1	bridge-domain 104
ip address 172.16.254.1	ip address 172.16.254.2	!
255.255.255.255	255.255.255.255	interface Loopback255
ip ospf 1 area 0	ip ospf 1 area 0	ip address 192.168.255.255
!	!	255.255.255.255
interface GigabitEthernet1/0/1	interface GigabitEthernet1/0/1	ip pim sparse-mode
no switchport	no switchport	ip ospf 2 area 0
ip address 172.16.13.1	ip address 172.16.23.2	ipv6 address
255.255.255.0	255.255.255.0	2001:192:168:255::255/128
ip ospf network point-to-point	ip ospf network point-to-point	ipv6 ospf 2 area 0
ip ospf 1 area 0	ip ospf 1 area 0	!
!	!	interface GigabitEthernet0/0/0
interface GigabitEthernet1/0/2	interface GigabitEthernet1/0/2	ip address 192.168.1.2
no switchport	no switchport	255.255.255.0
ip address 172.16.14.1	ip address 172.16.24.2	ip pim sparse-mode
255.255.255.0	255.255.255.0	ip ospf network point-to-point
ip ospf network point-to-point	ip ospf network point-to-point	ip ospf 2 area 0
ip ospf 1 area 0	ip ospf 1 area 0	negotiation auto
!	!	ipv6 address
interface GigabitEthernet1/0/4	interface GigabitEthernet1/0/4	2001:192:168:1::2/64
no switchport	no switchport	ipv6 ospf 2 area 0
ip address 172.16.16.1	ip address 172.16.26.2	ipv6 ospf network
255.255.255.0	255.255.255.0	point-to-point
ip ospf network point-to-point	ip ospf network point-to-point	!
ip ospf 1 area 0	ip ospf 1 area 0	interface GigabitEthernet0/0/3
!	!	no ip address
router ospf 1	router ospf 1	negotiation auto
router-id 172.16.255.1	router-id 172.16.255.2	service instance 103 ethernet
!	!	encapsulation dot1q 103
router bgp 65001	router bgp 65001	rewrite ingress tag pop 1
bgp router-id 172.16.255.1	bgp router-id 172.16.255.2	symmetric
bgp log-neighbor-changes	bgp log-neighbor-changes	bridge-domain 103
no bgp default ipv4-unicast	no bgp default ipv4-unicast	!
neighbor 172.16.255.2	neighbor 172.16.255.1	service instance 104 ethernet
remote-as 65001	remote-as 65001	encapsulation dot1q 104
neighbor 172.16.255.2	neighbor 172.16.255.1	rewrite ingress tag pop 1
update-source Loopback0	update-source Loopback0	symmetric
neighbor 172.16.255.3	neighbor 172.16.255.3	bridge-domain 104
remote-as 65001	remote-as 65001	!
neighbor 172.16.255.3	neighbor 172.16.255.3	!
update-source Loopback0	update-source Loopback0	interface BDI103
neighbor 172.16.255.4	neighbor 172.16.255.4	ip address 192.168.103.1
remote-as 65001	remote-as 65001	255.255.255.0
neighbor 172.16.255.4	neighbor 172.16.255.4	ip pim sparse-mode
update-source Loopback0	update-source Loopback0	ip ospf 2 area 0
neighbor 172.16.255.6	neighbor 172.16.255.6	ipv6 address
remote-as 65001	remote-as 65001	2001:192:168:103::1/64
neighbor 172.16.255.6	neighbor 172.16.255.6	ipv6 ospf 2 area 0
update-source Loopback0	update-source Loopback0	!
!	!	interface BDI104
address-family ipv4	address-family ipv4	ip address 192.168.104.1
exit-address-family	exit-address-family	255.255.255.0

Spine Switch 1	Spine Switch 2	External Device
!	!	ip pim sparse-mode
address-family l2vpn evpn	address-family l2vpn evpn	ip igmp static-group 239.1.1.2
neighbor 172.16.255.2 activate	neighbor 172.16.255.1 activate	source 10.1.102.11
neighbor 172.16.255.2	neighbor 172.16.255.1	ip igmp version 3
send-community both	send-community both	ip ospf 2 area 0
neighbor 172.16.255.2	neighbor 172.16.255.1	ipv6 address
route-reflector-client	route-reflector-client	2001:192:168:104::1/64
neighbor 172.16.255.3 activate	neighbor 172.16.255.3 activate	ipv6 ospf 2 area 0
neighbor 172.16.255.3	neighbor 172.16.255.3	!
send-community both	send-community both	router ospfv3 2
neighbor 172.16.255.3	neighbor 172.16.255.3	!
route-reflector-client	route-reflector-client	address-family ipv6 unicast
neighbor 172.16.255.4 activate	neighbor 172.16.255.4 activate	passive-interface BDI103
neighbor 172.16.255.4	neighbor 172.16.255.4	passive-interface BDI104
send-community both	send-community both	passive-interface Loopback255
neighbor 172.16.255.4	neighbor 172.16.255.4	exit-address-family
route-reflector-client	route-reflector-client	!
neighbor 172.16.255.6 activate	neighbor 172.16.255.6 activate	router ospf 2
neighbor 172.16.255.6	neighbor 172.16.255.6	passive-interface BDI103
send-community both	send-community both	passive-interface BDI104
neighbor 172.16.255.6	neighbor 172.16.255.6	!
route-reflector-client	route-reflector-client	ip pim rp-address
exit-address-family	exit-address-family	192.168.255.255
!	!	ip pim ssm range SSM
end	end	!
		ip access-list standard SSM
		10 permit 239.1.1.2
		!
		ipv6 pim rp-address
		2001:192:168:255::255
		!
		end

Return to Example 6: Configuring Optimized Layer 2 Overlay Multicast Interworking with External Network for IPv4 and IPv6, on page 137.

Return to Configuration Examples for Optimized Layer 2 Overlay Multicast, on page 10.

Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric

The following sections provide sample outputs for show commands to verify Optimized Layer 2 Overlay Multicast cofiguration for IPv4 and IPv6 multicast traffic handoff to an external network, on the devices in the topology configured above.

To see the outputs of **show** commands for IPv4 multicast traffic, refer Verifying Optimized Layer 2 Overlay Multicast for IPv4 Traffic with RP Outside the Fabric

The outputs of **show** commands for IPv6 multicast traffic are the following:

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::239:1:1:1
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)
----- ---------- --------------------------------------
------------------------------------ --------------------
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 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: 172.16.254.4, 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
```

Return to Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric, 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 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-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::239:1:1:1
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 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
```

Return to Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric, 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:BDFF: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
00:00:10 /
                                                                               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::239:1:1:1
EVI   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::239:1:1:1
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
```

Return to Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric, 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
```

Return to Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric, 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
```

Return to Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric, 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
```

Return to Verifying Optimized Layer 2 Overlay Multicast Configuration for IPv4 and IPv6 Traffic with RP Outside the Fabric, on page 146.