Configure Tenant Routed Multicast

This chapter contains these sections:

Tenant Routed Multicast

A Tenant Routed Multicast (TRM) is a VXLAN EVPN multicast forwarding solution that

- enables efficient multicast delivery across a multi-tenant VXLAN fabric using a BGP-based EVPN control plane
- supports multicast forwarding between senders and receivers within the same or different subnets and VTEPs, and
- improves Layer-3 overlay multicast scalability and efficiency for modern data center networks.

Tenant routed multicast brings standards-based multicast capabilities to the VXLAN overlay network by leveraging next generation multicast VPN (ngMVPN) as described in IETF RFC 6513 and 6514. TRM allows each edge device (VTEP) with a distributed IP Anycast Gateway to also act as a Designated Router (DR) for multicast forwarding. Bridged multicast forwarding is optimized through IGMP snooping, ensuring only interested receivers at the edge receive the multicast traffic, while all non-local multicast traffic is routed for efficient delivery.

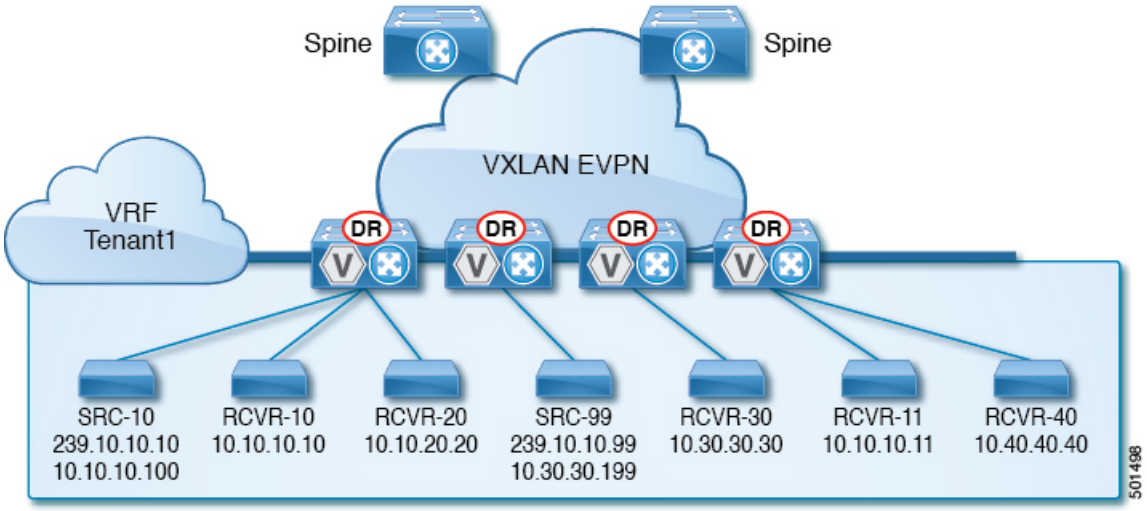
When TRM is enabled, multicast forwarding in the underlay network is used to replicate VXLAN-encapsulated routed multicast traffic. A Default Multicast Distribution Tree (Default-MDT) is built per VRF, which

supplements the existing multicast groups for Layer-2 VNI Broadcast, Unknown Unicast, and multicast replication. Overlay multicast groups are mapped to corresponding underlay multicast addresses for scalable transport. The BGP-based approach allows the fabric to distribute the rendezvous point (RP) functionality, making every VTEP an RP for multicast.

TRM enables seamless integration with existing multicast-enabled networks, supporting external multicast rendezvous points and tenant-aware external connectivity through Layer-3 physical or subinterfaces.

In a data center fabric using TRM, multicast sources and receivers can be located within the data center, in a separate campus network, or reachable externally via the WAN. TRM ensures multicast traffic reaches only interested receivers, even across different sites and tenants, while using underlay multicast replication to optimize bandwidth and resiliency.

Figure 1: VXLAN EVPN TRM



Tenant routed multicast mixed modes

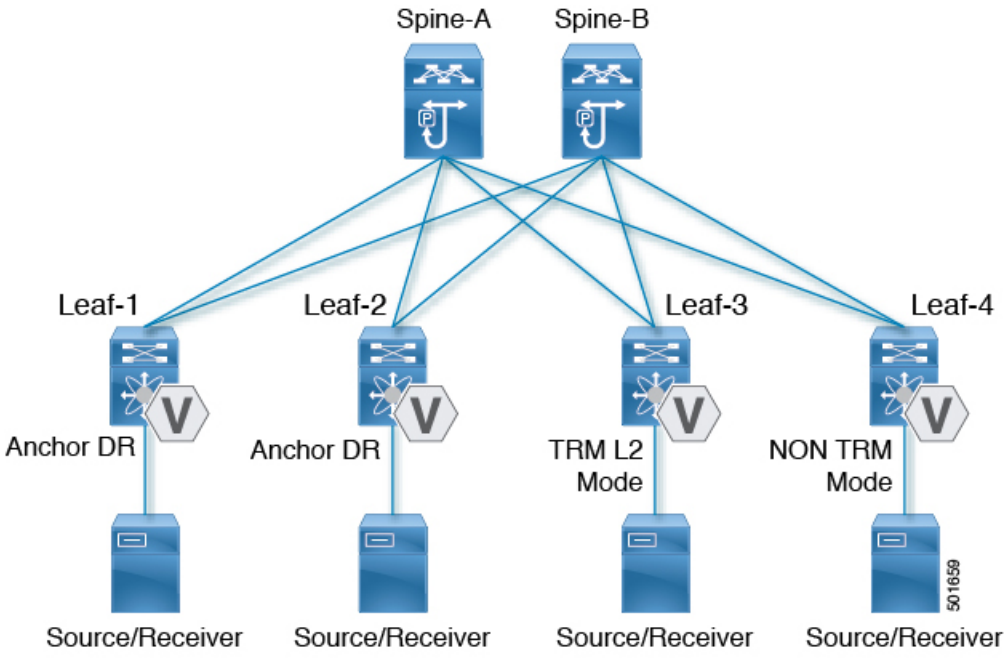
A tenant routed multicast mixed mode is a VXLAN multicast network feature that:

- enables TRM-capable and non-TRM-capable edge devices to coexist on the same fabric
- allows multicast traffic to be partially routed by TRM-capable devices but primarily bridged by legacy devices, and
- assigns one or more TRM-capable edge devices as gateways to translate multicast traffic between TRM and non-TRM domains.

This mixed mode approach ensures backward compatibility and simplifies migration to newer hardware across the fabric.

A network with both TRM-capable and non-TRM-capable devices uses mixed mode to ensure seamless multicast communication across the fabric.

Figure 2: TRM Layer 2/Layer 3 Mixed Mode



Features and limitations of Tenant Routed Multicast

Tenant Routed Multicast (TRM) has these guidelines and limitations:

TRM configuration limitations

- If VXLAN TRM feature is enabled on a VTEP, it would stop to send IGMP messages to the VXLAN fabric.
- The Guidelines and Limitations for VXLAN also apply to TRM.
- If TRM is configured, ISSU is disruptive.
- TRM supports IPv4 multicast only.
- TRM requires an IPv4 multicast-based underlay using PIM Any Source Multicast (ASM) which is also known as sparse mode.
- TRM supports overlay PIM ASM and PIM SSM only. PIM BiDir is not supported in the overlay.
- Both PIM and **ip igmp snooping vxlan** must be enabled on the L3 VNI's VLAN in a VXLAN vPC setup.

Unsupported features

- With TRM enabled, SVI as a core link is not supported.
- TRM with Multi-Site is not supported on Cisco Nexus 9504-R platforms.

RP support

- RP has to be configured either internal or external to the fabric.
- The internal RP must be configured on all TRM-enabled VTEPs including the border nodes.
- The external RP must be external to the border nodes.
- The RP must be configured within the VRF pointing to the external RP IP address (static RP). This ensures that unicast and multicast routing is enabled to reach the external RP in the given VRF.
- In a Transit Routing Multicast (TRM) deployment, the RP-on-stick model can sometimes lead to traffic drops if there is flapping on the Protocol Independent Multicast (PIM) enabled interface. Use the **ip pim spt-switch-graceful** command on the turnaround router that leads to the RP. This command allows for a graceful switch to the Shortest Path Tree (SPT) during flapping, which can minimize traffic drops.
- TRM supports multiple border nodes. Reachability to an external RP/source via multiple border leaf switches is supported with ECMP and requires symmetric unicast routing.
- For traffic streams with an internal source and external L3 receiver using an external RP, the external L3 receiver might send PIM S,G join requests to the internal source. Doing so triggers the recreation of S,G on the fabric FHR, and it can take up to 10 minutes for this S,G to be cleared.

Replication support

FEX support and limitations

- With Tenant Routed Multicast enabled, FEX is not supported.

Supported platforms

- Beginning with Cisco NX-OS Release 10.1(2), TRM Multisite with vPC BGW is supported.

BGW support

Recommended configuration

- For Tenant Routed Multicast with eBGP underlay:

  If all leaf switches use the same AS and spine switches use a different AS, enable the **maximum-paths** command under the address-family ipv4/ipv6 mvpn on the spines.

  This configuration allows spine switches to advertise all available paths to remote peers.

Supported features and limitations of Layer 3 TRM

Layer 3 Tenant Routed Multicast (TRM) has these configuration guidelines and limitations:

- When configuring TRM VXLAN BGP EVPN, the following platforms are supported:
  - Cisco Nexus 9200, 9332C, 9364C, 9300-EX, and 9300-FX/FX2/FX3/FXP platform switches.
  - Cisco Nexus 9300-GX platform switches.

  - Cisco Nexus 9500 platform switches with 9700-EX line cards, 9700-FX line cards, or a combination of both line cards.

- Layer 3 TRM and VXLAN EVPN Multi-Site are supported on the same physical switch. For more information, see Configure Multi-Site.
- TRM with vPC border leafs is supported only for Cisco Nexus 9200, 9300-EX, and 9300-FX/FX2/FX3 platform switches and Cisco Nexus 9500 platform switches with -EX/FXor -R/RX line cards. The **advertise-pip** and **advertise virtual-rmac** commands must be enabled on the border leafs to support this functionality. For configuration information, see the "Configuring VIP/PIP" section.
- To support any Layer 3 source behind one of the vPC peers, whether physical or virtual MCT, a physical link configured as VRF-lite is required between the vPC peers. This setup is necessary to accommodate a receiver located behind the vPC peer, especially if it is the sole receiver in the fabric. This requirement applies to all scenarios where the vPC functions as a BGW, border Leaf, or an internal Leaf.

  On the receiving vPC peer, the VRF-lite link must have a superior reachability metric to the L3 source compared to any other paths (iBGP or eBGP) to be selected as the RPF towards the L3 source. In this configuration, traffic will flow directly to the receiver without traversing the EVPN fabric.
- Well-known local scope multicast (224.0.0.0/24) is excluded from TRM and is bridged.
- When an interface NVE is brought down on the border leaf, the internal overlay RP per VRF must be brought down.

ISSU

- When upgrading from Cisco NX-OS Release 9.3(3) to Cisco NX-OS Release 9.3(6), if you do not retain configurations of the TRM enabled VRFs from Cisco NX-OS Release 9.3(3), or if you create new VRFs after the upgrade, the auto-generation of **ip multicast multipath s-g-hash next-hop-based** CLI, when **feature ngmvpn** is enabled, will not happen. You must enable the CLI manually for each TRM enabled VRF.

TRM Flow Path Visualization support

Layer 3 TRM supported platforms and release

- Layer 3 TRM is supported for Cisco Nexus 9200, 9300-EX, and 9300-FX/FX2/FX3/FXP and 9300-GX platform switches.

Support for combination of Layer 3 TRM and EVPN Multi-Site

- Beginning with Cisco NX-OS Release 9.3(7), Cisco Nexus N9K-C9316D-GX, N9K-C9364C-GX, and N9K-X9716D-GX platform switches support the combination of Layer 3 TRM and EVPN Multi-Site.
- Cisco Nexus 9300-GX platform switches do not support the combination of Layer 3 TRM and EVPN Multi-Site in Cisco NX-OS Release 9.3(5).

Support on Nexus 9800 Series switches

Support on -R/RX linecards

- Beginning with Cisco NX-OS Release 9.3(3), the Cisco Nexus 9504 and 9508 platform switches with -R/RX line cards support TRM in Layer 3 mode. This feature is supported on IPv4 overlays only. Layer 2 mode and L2/L3 mixed mode are not supported.

  The Cisco Nexus 9504 and 9508 platform switches with -R/RX line cards can function as a border leaf for Layer 3 unicast traffic. For Anycast functionality, the RP can be internal, external, or RP everywhere.

- TRM Multi-Site functionality is not supported on Cisco Nexus 9504 platform switches with -R/RX line cards.

- If one or both VTEPs is a Cisco Nexus 9504 or 9508 platform switch with -R/RX line cards, the packet TTL is decremented twice, once for routing to the L3 VNI on the source leaf and once for forwarding from the destination L3 VNI to the destination VLAN on the destination leaf.

Supported features and platforms for Layer 2/Layer 3 TRM (Mixed Mode)

Layer 2/Layer 3 Tenant Routed Multicast (TRM) in Mixed Mode supports the following configurations, platforms, and guidelines:

- All TRM Layer 2/Layer 3 configured switches must be Anchor DR. This is because in TRM Layer 2/Layer 3, you can have switches configured with TRM Layer 2 mode that co-exist in the same topology. This mode is necessary if non-TRM and Layer 2 TRM mode edge devices (VTEPs) are present in the same topology.

- Anchor DR is required to be an RP in the overlay.

- An extra loopback is required for anchor DRs.

- Non-TRM and Layer 2 TRM mode edge devices (VTEPs) require an IGMP snooping querier configured per multicast-enabled VLAN. Every non-TRM and Layer 2 TRM mode edge device (VTEP) requires this IGMP snooping querier configuration because in TRM multicast control-packets are not forwarded over VXLAN.

- The IP address for the IGMP snooping querier can be re-used on non-TRM and Layer 2 TRM mode edge devices (VTEPs).

- The IP address of the IGMP snooping querier in a VPC domain must be different on each VPC member device.

- When interface NVE is brought down on the border leaf, the internal overlay RP per VRF should be brought down.

- The NVE interface must be shut and unshut while configuring the **ip multicast overlay-distributed-dr** command.

- Beginning with Cisco NX-OS Release 9.2(1), TRM with vPC border leafs is supported. Advertise-PIP and Advertise Virtual-Rmac need to be enabled on border leafs to support with functionality. For configuring advertise-pip and advertise virtual-rmac, see the "Configuring VIP/PIP" section.

Supported platforms

Anchor DR is supported only on these platforms:

- Cisco Nexus 9200, 9300-EX, and 9300-FX/FX2 platform switches
- Cisco Nexus 9500 platform switches with 9700-EX line cards, 9700-FX line cards, or a combination of both line cards

Unsupported features and platforms

- Layer 2/Layer 3 Tenant Routed Multicast (TRM) is not supported on Cisco Nexus 9300-FX3/GX platform switches.

Supported rendezvous point options by TRM mode

With TRM enabled Internal and External RP is supported. These tables provide information about which TRM modes support internal and external rendezvous point (RP) options, along with the minimum supported NX-OS release for each combination. This information helps network designers and administrators determine the appropriate TRM modes and software versions needed for specific RP deployments.

Table 1: TRM RP support

Mode	RP Internal	RP External	PIM-Based RP Everywhere
TRM L2 Mode	N/A	N/A	N/A

Mode	RP Internal	RP External	PIM-Based RP Everywhere
TRM L3 Mode	7.0(3)I7(1), 9.2(x)	7.0(3)I7(4), 9.2(3)	Supported in 7.0(3)I7(x) releases starting from 7.0(3)I7(5) Not supported in 9.2(x) Supported in NX-OS releases beginning with 9.3(1) for the following Nexus 9000 switches: • Cisco Nexus 9200 Series switches • Cisco Nexus 9364C platform switches • Cisco Nexus 9300-EX/FX/FX2 platform switches (excluding the Cisco Nexus 9300-FXP platform switch) Supported for Cisco Nexus 9300-FX3 platform switches beginning with Cisco NX-OS Release 9.3(5)
TRM L2L3 Mode	7.0(3)I7(1), 9.2(x)	N/A	N/A

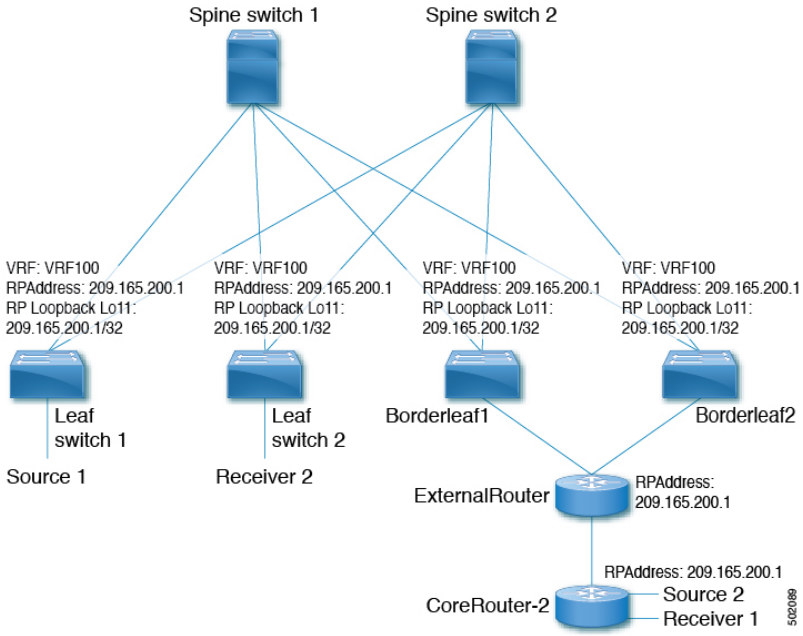
Options for rendezvous points in TRM deployments

For Tenant Routed Multicast, these rendezvous point options are supported:

- Configuring a rendezvous point inside the VXLAN fabric : Use when the rendezvous point operates within the VXLAN fabric, centralizing multicast management within the network.
- Configuring an external rendezvous point : Use when the rendezvous point is outside the VXLAN fabric, enabling multicast sources and receivers across separate network domains.
- Configuring RP everywhere with PIM Anycast : Enables use of Anycast for distributed rendezvous points.
- Configuring RP everywhere with MSDP peering : Enables distributed rendezvous points using Multicast Source Discovery Protocol (MSDP) peering.

Configure a rendezvous point inside the VXLAN fabric

Configure the loopback interface and related parameters for TRM VRFs on all VTEPs. This ensures multicast traffic is managed correctly and efficiently throughout the fabric. The loopback address must be reachable and advertised in EVPN.



Follow these steps to configure the rendezvous point inside the VXLAN fabric:

Before you begin

- Verify that all devices (VTEPs) support TRM VRFs.
- Ensure network connectivity so the loopback address is reachable in EVPN.
- Plan and reserve the loopback IP address for the RP.

Procedure

Step 1 Enter global configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Configure the loopback interface for use with multicast RP on all TRM-enabled nodes.

Example:

```
switch(config)# interface loopback 11
```

Step 3 Assign the loopback interface to the correct VRF.

Example:

```
switch(config-if)# vrf member vrf100
```

Step 4 Specify the IP address for the loopback interface.

Example:

```
switch(config-if)# ip address 209.165.200.1/32
```

Step 5 Enable PIM sparse-mode on the loopback interface.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 6 Create the VXLAN tenant VRF if it does not already exist.

Example:

```
switch(config-if)# vrf context vrf100
```

Step 7 Configure the RP address and group-list for multicast.

Example:

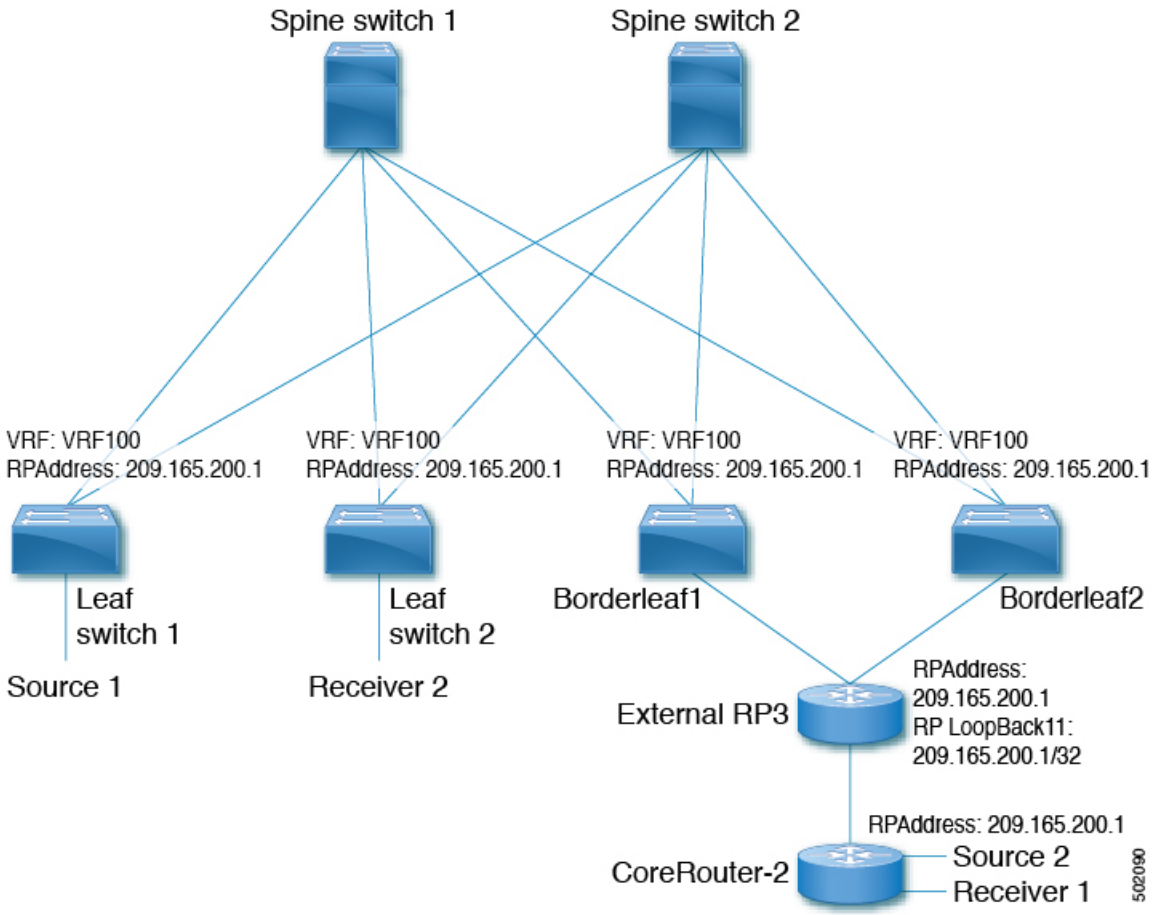
```
switch(config-vrf# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

Use the same RP IP address for all edge devices (VTEPs) to enable a fully distributed RP.

The rendezvous point for multicast is configured and distributed across all VTEPs in the VXLAN fabric, allowing for efficient multicast routing and group communication.

Configure an external rendezvous point

Configure the external rendezvous point (RP) IP address within the TRM VRFs on all devices (VTEP). In addition, ensure reachability of the external RP within the VRF via the border node.



Follow these steps to configure an external rendezvous point:

Before you begin

Ensure TRM is enabled.

- Identify the RP IP address to use.
- Confirm all relevant VTEP and border node devices are reachable.
- Ensure only one routing path (non-ECMP) is active between the TRM fabric and the external RP via a single border leaf.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enter the target TRM VRF context.

Example:

```
switch(config)# vrf context vrf100
```

Step 3 Configure the multicast RP address for the VRF.

Example:

```
switch(config-vrf)# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

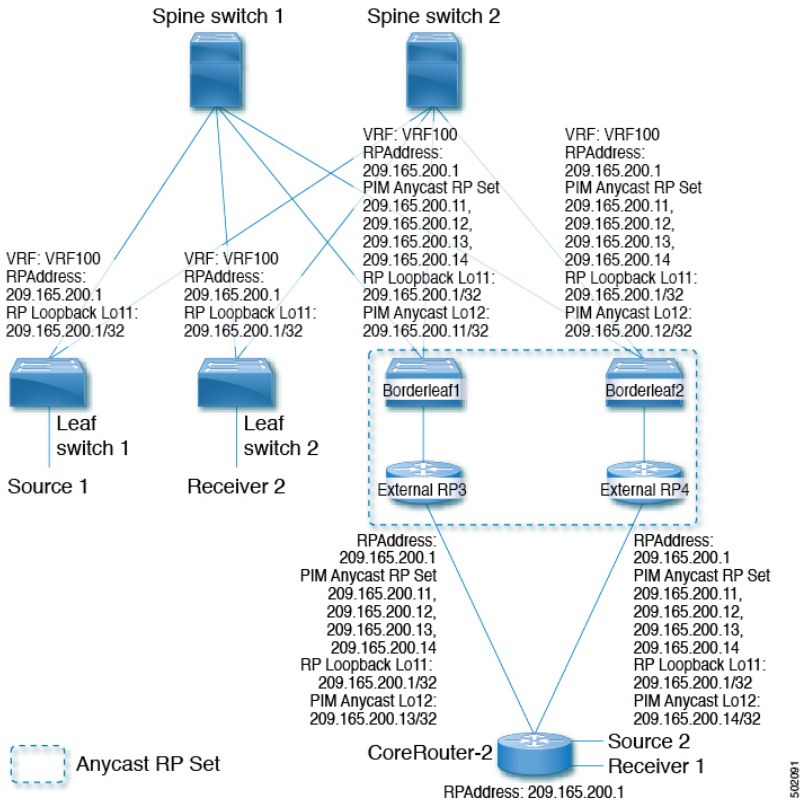
Use the same RP IP address on all edge devices (VTEPs) for a distributed RP setup.

The external rendezvous point is configured for multicast in the TRM fabric. All devices in the specified VRFs use the designated RP, and multicast routing traverses a single, controlled border node as intended.

RP Everywhere with PIM Anycast solution

RP Everywhere with PIM Anycast provides these features and benefits:

- Enables efficient Rendezvous Point (RP) redundancy and load sharing for multicast routing.
- Supports seamless failover using Anycast addresses, minimizing service interruptions.
- Allows multiple RPs to share a single logical Anycast address for improved scalability.
- Provides automatic failover between RPs, enhancing network resilience.
- Simplifies configuration and ongoing maintenance for multicast deployments.
- Maintains seamless multicast signaling across the network.



For information about configuring RP Everywhere with PIM Anycast, see:

- Configure a TRM leaf node for RP Everywhere with PIM Anycast, on page 13
- Configure a TRM border leaf node for RP Everywhere with PIM Anycast, on page 14
- Configure an external router for RP Everywhere with PIM Anycast , on page 16

Configure a TRM leaf node for RP Everywhere with PIM Anycast

Perform this configuration on each VXLAN VTEP device that will participate as a distributed RP in an Anycast RP model for multicast routing.

Before you begin

- Ensure device access with the necessary privileges.
- Determine the loopback interface number, VRF name, RP IP address, and multicast group range to be used.
- Verify that all edge devices (VTEPs) share the same RP IP address.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Create and configure a loopback interface for RP functionality on each VXLAN VTEP.

Example:

```
switch(config)# interface loopback 11
```

Assign the desired loopback interface number.

Step 3 Assign the loopback interface to the relevant VRF.

Example:

```
switch(config-if)# vrf member vrf100
```

Step 4 Set an IP address for the loopback interface.

Example:

```
switch(config-if)# ip address 209.165.200.1/32
```

Step 5 Enable PIM sparse mode on the loopback interface.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 6 Create the VXLAN tenant VRF context.

Example:

```
switch(config-if)# vrf context vrf100
```

Step 7 Configure the RP address and group list for PIM, specifying the RP IP address and multicast group range.
ip pim rp-address *ip-address-of-router* **group-list** *group-range-prefix*

Example:

```
switch(config-vrf# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

The TRM leaf node is configured as a distributed Rendezvous Point (RP) for RP Everywhere, supporting PIM Anycast within the specified VXLAN tenant.

Configure a TRM border leaf node for RP Everywhere with PIM Anycast

Configure a TRM border leaf node to enable distributed RP functionality for multicast routing with PIM Anycast in a VXLAN-EVPN fabric.

Follow these steps to configure the TRM border leaf node:

Before you begin

- Ensure you have the required IP addresses and VRF names.
- Confirm administrative access to the switch.
- Verify VXLAN-EVPN mode is enabled.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Configure VXLAN VTEP as TRM border leaf node.

Example:

```
switch(config)# ip pim evpn-border-leaf
```

Step 3 Create loopback interfaces for TRM and RP Anycast.

Example:

```
switch(config)# interface loopback 11
switch(config)# interface loopback 12
switch(config-if)#
```

Step 4 Assign VRF to each loopback interface.

Example:

```
!For TRM
switch(config-if)# vrf member vrf100
!For RP loopback
switch(config-if)# vrf member vxlan100
```

Step 5 Specify IP addresses for loopback interfaces.

Example:

```
!For TRM
switch(config-if)# ip address 209.165.200.1/32
!For RP loopback
switch(config-if)# ip address 209.165.200.11/32
```

Step 6 Enable sparse-mode PIM on both loopback interfaces.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 7 Create a VXLAN tenant VRF.

Example:

```
switch(config-if)# vrf context vrf100
```

Step 8 Configure the PIM RP address and group list.

Example:

```
switch(config-vrf)# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

Step 9 Configure PIM Anycast RP set with required addresses.

Example:

```
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.11
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.12
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.13
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.14
```

The TRM border leaf node now serves as a distributed RP with PIM Anycast, ready to support multicast traffic in the VXLAN-EVPN fabric.

Configure an external router for RP Everywhere with PIM Anycast

Configure an external router to act as a Rendezvous Point (RP) for multicast traffic, using Protocol Independent Multicast (PIM) Anycast RP for redundancy and scalability.

Follow these steps to configure the external router for RP Everywhere with PIM Anycast:

Before you begin

- Ensure you have administrative access to the router.
- Identify the loopback interfaces and VRF names to be used.
- Gather the required IP addresses for the PIM Anycast RP set.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Create the first loopback interface.

Example:

```
switch(config)# interface loopback 11
```

Step 3 Assign the loopback interface to a VRF.

Example:

```
switch(config-if)# vrf member vfr100
```

Step 4 Assign an IP address to the loopback interface.

Example:

```
switch(config-if)# ip address 209.165.200.1/32
```

Step 5 Enable PIM sparse mode on the loopback interface.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 6 Create a second loopback interface for additional Anycast RP.

Example:

```
switch(config)# interface loopback 12
```

a) Repeat Steps 3–5 for this interface with its respective VRF and IP

Example:

```
switch(config-if)# vrf member vrf100
switch(config-if)# ip address 209.165.200.13/32
switch(config-if)# ip pim sparse-mode
```

Step 7 Create the VXLAN tenant VRF if not already created.

Example:

```
switch(config-if)# vrf context vrf100
```

Step 8 Configure the PIM RP address and group-list.

Example:

```
switch(config-vrf)# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

Step 9 Configure PIM Anycast RP set with required addresses. **ip pim anycast-rp** *anycast-rp-address address-of-rp*

Example:

```
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.11
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.12
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.13
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.14
```

The router is configured as a PIM Anycast Rendezvous Point, providing a resilient multicast RP for the network.

Features of RP Everywhere with MSDP peering solutions

RP Everywhere with MSDP peering is a multicast routing solution that offers the following features:

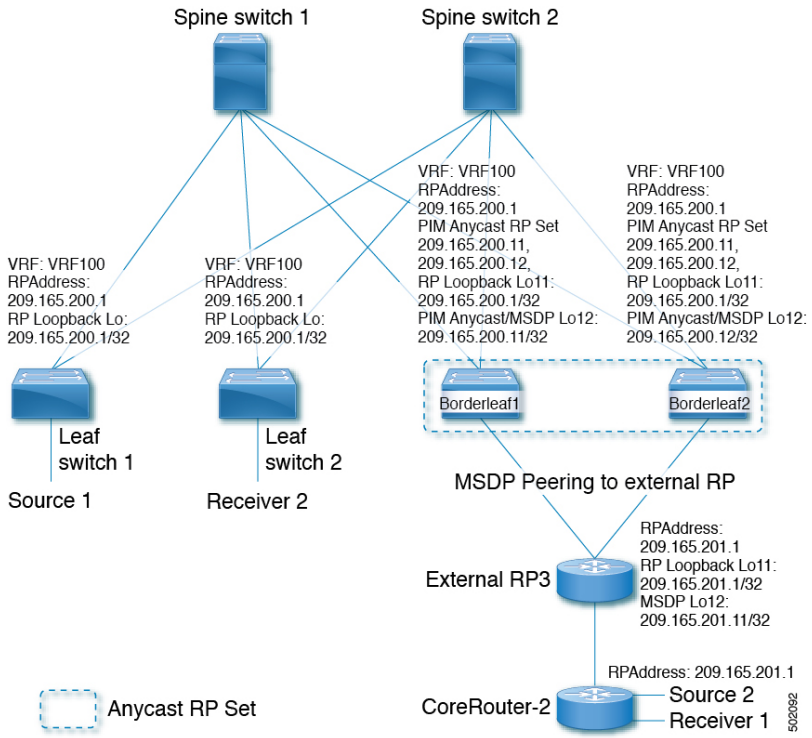
- Each router can act as a Rendezvous Point (RP) for its own domain, improving local multicast source management.
- Multicast Source Discovery Protocol (MSDP) enables sharing of multicast source information between RPs in different domains, allowing seamless inter-domain multicast communication.
- The solution provides redundancy, scalability, and resiliency for multicast services across network segments.

This approach is beneficial for large-scale multicast deployments where high availability and inter-domain source discovery are required.

For information about configuring RP Everywhere with MSDP Peering, see:

- Configure a TRM leaf node for RP Everywhere with MSDP peering, on page 18
- Configure a TRM border leaf node for RP Everywhere with MSDP peering, on page 19
- Configure an external router for RP Everywhere with MSDP peering, on page 21

Figure 3: RP Everywhere configuration with MSDP RP solution



Configure a TRM leaf node for RP Everywhere with MSDP peering

Configure a TRM leaf node to support RP Everywhere architecture using MSDP peering, allowing distributed Rendezvous Point (RP) functionality for multicast routing in a VXLAN environment.

Follow these steps to configure a TRM leaf node for RP Everywhere with MSDP peering:

Before you begin

- Confirm you are logged in with administrative privileges.
- Verify VXLAN and multicast routing features are enabled.
- Gather the required IP addresses and VRF names for configuration.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Configure the loopback interface on all VXLAN VTEP devices.

Example:

```
switch(config)# interface loopback 11
```

Step 3 Assign the loopback interface to the appropriate VRF.

Example:

```
switch(config-if)# vrf member vrf100
```

Step 4 Specify the IP address for the loopback interface.

Example:

```
switch(config-if)# ip address 209.165.200.1/32
```

Specify IP address.

Step 5 Enable PIM sparse mode on the loopback interface.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 6 Create the VXLAN tenant VRF context.

Example:

```
switch(config-if)# vrf context vrf100
```

Step 7 Configure the RP address and multicast group range for MSDP peering.

Example:

```
switch(config-vrf# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

The TRM leaf node is now configured for RP Everywhere with MSDP peering, enabling distributed multicast routing across all VXLAN VTEP edge devices.

Configure a TRM border leaf node for RP Everywhere with MSDP peering

Configure a TRM border leaf node to function as an Anycast Rendezvous Point (RP) with MSDP peering for multicast source discovery in a VXLAN EVPN fabric

Follow these steps to configure the TRM border leaf node:

Before you begin

- Identify the loopback interfaces and IP addresses for the Anycast RP.
- Determine the VRF name used for multicast routing.
- Ensure your device supports PIM and MSDP features.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enable the MSDP feature.

Example:

```
switch(config)# feature msdp
```

Step 3 Configure VXLAN VTEP as TRM border leaf node,

Example:

```
switch(config)# ip pim evpn-border-leaf
```

Step 4 Create the first loopback interface for the primary Anycast RP address:

a) Assign the VRF membership.

Example:

```
switch(config)# interface loopback 11
switch(config-if)# vrf member vrf100
```

b) Configure the Anycast RP IP address.

Example:

```
switch(config-if)# ip address 209.165.200.1/32
```

c) Enable PIM sparse mode.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 5 Create the second loopback interface for Anycast RP redundancy

a) Assign the VRF membership.

Example:

```
switch(config)# interface loopback 12
switch(config-if)# vrf member vrf100
```

b) Configure the Anycast RP IP address.

Example:

```
switch(config-if)# ip address 209.165.200.11/32
```

c) Enable PIM sparse mode.

Example:

```
switch(config-if)# ip pim sparse-mode
```

Step 6 Create the tenant VRF context for multicast:

Example:

```
switch(config-if)# vrf context vrf100
```

Step 7 Configure the RP address and group list for PIM in the VRF.

Example:

```
switch(config-vrf)# ip pim rp-address 209.165.200.1 group-list 224.0.0.0/4
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

Step 8 Configure PIM Anycast RP set and assign all participating RP addresses

Example:

```
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.11
```

Configure PIM Anycast RP set.

Step 9 Configure MSDP originator ID and peer under the VRF:

a) Assign the originator loopback.

Example:

```
switch(config-vrf)# ip pim anycast-rp 209.165.200.1 209.165.200.12
switch(config-vrf)# ip msdp originator-id loopback12
```

b) Define the MSDP peer and source loopback

Example:

loopback

```
switch(config-vrf)# ip msdp peer 209.165.201.11 connect-source loopback12
```

The TRM border leaf node is enabled as an Anycast RP, participating in MSDP peering for distributed multicast routing in the fabric.

Configure an external router for RP Everywhere with MSDP peering

Configure an external router to support Rendezvous Point (RP) Everywhere multicast operation using MSDP peering.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enable the MSDP feature.

Example:

```
switch(config)# feature msdp
```

Step 3 Configure the first loopback interface on all VXLAN VTEP devices.

Example:

```
switch(config)# interface loopback 11
switch(config-if)# vrf member vrf100
switch(config-if)# ip address 209.165.201.1/32
switch(config-if)# ip pim sparse-mode
```

Step 4 Configure the PIM Anycast set RP loopback interface.

Example:

```
switch(config)# interface loopback 12
switch(config-if)# vrf member vrf100
```

```
switch(config-if)# ip address 209.165.201.11/32
switch(config-if)# ip pim sparse-mode
```

Configure the PIM Anycast set RP loopback interface.

Step 5 Create the VXLAN tenant VRF.

Example:

```
switch(config-if)# vrf context vrf100
```

Step 6 Configure the Rendezvous Point (RP) address and multicast group range.

Example:

```
switch(config-vrf)# ip pim rp-address 209.165.201.1 group-list 224.0.0.0/4
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

Step 7 Set the MSDP originator ID to the Anycast RP loopback

Example:

```
switch(config-vrf)# ip msdp originator-id loopback12
```

Step 8 Establish MSDP peering with each TRM border node

Example:

```
switch(config-vrf)# ip msdp peer 209.165.200.11 connect-source loopback12
```

Configure MSDP peering between external RP router and all TRM border nodes.

The external router is now configured as an RP and MSDP peer, supporting distributed multicast operation for VXLAN in the network.

Configure Layer 3 Tenant Routed Multicast

This procedure enables the Tenant Routed Multicast (TRM) feature. TRM operates primarily in the Layer 3 forwarding mode for IP multicast by using BGP MVPN signaling. TRM in Layer 3 mode is the main feature and the only requirement for TRM enabled VXLAN BGP EVPN fabrics. If non-TRM capable edge devices (VTEPs) are present, the Layer 2/Layer 3 mode and Layer 2 mode have to be considered for interop.

To forward multicast between senders and receivers on the Layer 3 cloud and the VXLAN fabric on TRM vPC border leafs, the VIP/PIP configuration must be enabled. For more information, see Configuring VIP/PIP.

Note TRM follows an always-route approach and hence decrements the Time to Live (TTL) of the transported IP multicast traffic.

Follow these steps to configure Layer 3 Tenant Routed Multicast:

Before you begin

- Ensure VXLAN EVPN (`feature nv overlay`, `nv overlay evpn`) is enabled.
- Confirm the rendezvous point (RP) is configured.

- Enable PIM v4/v6 if TRM v4/v6 is needed.

Procedure

Step 1 Enable the Next-Generation Multicast VPN (ngMVPN) control plane.

Example:

```
switch# configure terminal
switch(config)# feature ngmvpn
```

New address family commands become available in BGP.

You will get a syslog message when you enable this command. The message informs you that **ip multicast multipath s-g-hash next-hop-based** is the recommended multipath hashing algorithm and you need enable it for the TRM enabled VRFs.

The auto-generation of **ip multicast multipath s-g-hash next-hop-based** command does not happen after you enable the **feature ngmvpn** command. You need to configure **ip multicast multipath s-g-hash next-hop-based** as part of the VRF configuration.

Step 2 Configure IGMP snooping for VXLAN VLANs.

Example:

```
switch(config)# ip igmp snooping vxlan
```

Step 3 Configure the NVE (Network Virtualization Edge) interface and associate the Layer 3 VNI with the VRF.

Example:

```
switch(config)# interface nve 1
switch(config-if-nve)# member vni 200100 associate-vrf
switch(config-if-nve-vni)# mcast-group 225.3.3.3
```

The range of *vni-range* is from 1 to 16,777,214.

Builds the default multicast distribution tree for the VRF VNI (Layer 3 VNI).

The multicast group is used in the underlay (core) for all multicast routing within the associated Layer 3 VNI (VRF).

Note
We recommend that underlay multicast groups for Layer 2 VNI, default MDT, and data MDT not be shared. Use separate, non-overlapping groups.

Step 4 Set up BGP and enable multicast VPN for the peer

Example:

```
switch(config)# router bgp 100
switch(config-router)# neighbor 1.1.1.1
switch(config-router-neighbor)# address-family ipv4 mvpn
switch(config-router-neighbor-af)# send-community extended
```

Enables ngMVPN for address family signalization. The **send community extended** command ensures that extended communities are exchanged for this address family.

Step 5 Enable recommended multipath hashing for TRM-enabled VRFs.

Example:

```
switch(config-vrf)# ip multicast multipath s-g-hash next-hop-based
```

Configures multicast multipath and initiates S, G, nexthop hashing (rather than the default of S/RP, G-based hashing) to select the RPF interface.

Step 6 Specify the rendezvous point (RP) address for multicast traffic.

Example:

```
switch(config-vrf)# ip pim rp-address 209.165.201.1 group-list 226.0.0.0/8
```

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

For overlay RP placement options, see the Options for rendezvous points in TRM deployments , on page 8 section.

Step 7 Configure SVI for Layer 2 and Layer 3 VNIs, assign VRF membership, and enable PIM as required.

Example:

```
switch(config)# interface vlan11
switch(config-if)# no shutdown
switch(config-if)# vrf member vrf100
switch(config-if)# ip address 11.1.1.1/24
switch(config-if)# ip pim sparse-mode
switch(config-if)# ip pim neighbor-policy route-map1 !if preventing PIM neighborship on
L2VNI SVI
switch(config-if)# fabric forwarding mode anycast-gateway !as needed
switch(config-if)# ip forward !for L3VNI SVI
```

Configures the first-hop gateway (distributed anycast gateway for the Layer 2 VNI. No router PIM peering must ever happen with this interface.

Creates an IP PIM neighbor policy with a suitable route-map to deny any IPv4 addresses, preventing PIM from establishing PIM neighborship on the L2VNI SVI.

Note
Do not use Distributed Anycast Gateway for PIM Peerings.

Step 8 Configure the BGP address family for unicast and set the auto route-target for multicast VPN.

Example:

```
switch(config-vrf)# address-family ipv4 unicast
switch(config-vrf-af-ipv4)# route-target both auto mvpn
switch(config)# ip multicast overlay-spt-only
```

Defines the BGP route target that is added as an extended community attribute to the customer multicast (C_Multicast) routes (ngMVPN route type 6 and 7).

Auto route targets are constructed by the 2-byte Autonomous System Number (ASN) and Layer 3 VNI.

Gratuitously originate (S,A) route when the source is locally connected. The **ip multicast overlay-spt-only** command is enabled by default on all MVPN-enabled Cisco Nexus 9000 Series switches (typically leaf node).

Layer 3 Tenant Routed Multicast is enabled, providing IP multicast forwarding for tenants over the VXLAN BGP EVPN fabric.

Configure TRM on the VXLAN EVPN spine

This procedure enables Tenant Routed Multicast (TRM) on a VXLAN EVPN spine switch.

Follow these steps to configure TRM on the VXLAN EVPN spine:

Before you begin

- Confirm that the VXLAN BGP EVPN spine configuration is complete. For more information see Configure iBGP for EVPN on the spine.
- Ensure you know your BGP autonomous system numbers and neighbor IP addresses.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Create a route-map to retain the next-hop for EVPN routes.

Example:

```
switch(config)# route-map permitall permit 10
```

Note
The route-map keeps the next-hop unchanged for EVPN routes

- Required for eBGP
- Options for iBGP

Step 3 Retain the next-hop attribute in the route-map.

Example:

```
switch(config-route-map)# set ip next-hop unchanged
switch(config-route-map)# exit
switch(config)#
```

Note
The route-map keeps the next-hop unchanged for EVPN routes

- Required for eBGP
- Options for iBGP

Step 4 Enter BGP router configuration mode using your AS number.

Example:

```
switch(config)# router bgp 65002
```

Specify BGP.

Step 5 Configure the address family IPv4 MVPN under the BGP.

Example:

```
switch(config-router)# address-family ipv4 mvpn
```

Step 6 Configure retain route-target all under address-family IPv4 MVPN [global].

Example:

```
switch(config-router-af)# retain route-target all
```

Note
Required for eBGP. Allows the spine to retain and advertise all MVPN routes when there are no local VNIs configured with matching import route targets.

Step 7 Configure your BGP multicast VPN neighbor.

Example:

```
switch(config-router-af)# neighbor 100.100.100.1
```

Step 8 Under the neighbor's IPv4 MVPN address-family, apply TRM-specific settings:

Example:

```
switch(config-router-neighbor)# address-family ipv4 mvpn
```

a) If using eBGP, enter:

Example:

```
switch(config-router-neighbor-af)# disable-peer-as-check
switch(config-router-neighbor-af)# rewrite-rt-asn
switch(config-router-neighbor-af)# send-community extended
switch(config-router-neighbor-af)# route-map permitall out
```

Configure **disable-peer-as-check** parameter on the spine for eBGP when all leafs are using the same AS but the spines have a different AS than leafs.

The **rewrite-rt-asn** command is required if the route target auto feature is being used to configure EVPN route targets.

b) If using iBGP with route reflectors, enter:

Example:

```
switch(config-router-neighbor-af)# route-reflector-client
```

Step 9 Exit configuration and save your changes.

TRM is enabled on the VXLAN EVPN spine, supporting multicast routing for tenant networks.

Configure TRM in Layer 2 and Layer 3 mixed mode

This procedure enables the Tenant Routed Multicast (TRM) feature. This enables both Layer 2 and Layer 3 multicast BGP signaling. This mode is only necessary if non-TRM edge devices (VTEPs) are present in the Cisco Nexus 9000 Series switches (1st generation) . Only the Cisco Nexus 9000-EX and 9000-FX switches can do Layer 2/Layer 3 mode (Anchor-DR).

To forward multicast between senders and receivers on the Layer 3 cloud and the VXLAN fabric on TRM vPC border leafs, the VIP/PIP configuration must be enabled. For more information, see Configuring VIP/PIP.

All Cisco Nexus 9300-EX and 9300-FX platform switches must be in Layer 2/Layer 3 mode.

Follow these steps to configure Tenant Routed Multicast (TRM) in Layer 2/Layer 3 mixed mode:

Before you begin

- Ensure VXLAN EVPN is configured.
- Ensure the rendezvous point (RP) is configured for multicast.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enable ngMVPN and advertise EVPN multicast.**feature ngmvpn**

Example:

```
switch(config)# feature ngmvpn
switch(config)# advertise evpn multicast
```

Step 3 Enable IGMP snooping for VXLAN VLANs.

Example:

```
switch(config)# ip igmp snooping vxlan
```

Step 4 Enable multicast overlay SPT-only and distributed anchor DR.

Example:

```
switch(config)# ip multicast overlay-spt-only
switch(config)# ip multicast overlay-distributed-dr
```

Gratuitously originate (S,A) route when source is locally connected. The **ip multicast overlay-spt-only** command is enabled by default on all MVPN-enabled Cisco Nexus 9000 Series switches (typically leaf nodes).

Note
You must shut and unshut the NVE interface after configuring **ip multicast overlay-distributed-dr**.

Step 5 Configure the NVE interface, associate Layer 3 VNIs, and assign multicast groups.

Example:

```
switch(config)# interface nve 1
switch(config-if-nve)# member vni 200100 associate-vrf
switch(config-if-nve-vni)# mcast-group 225.3.3.3
```

The range of *vni-range* is from 1 to 16,777,214.

Step 6 Set up loopback interface on all anchor DR devices, and configure OSPF and PIM.

Example:

```
switch(config-if-nve)# interface loopback 10
switch(config-if)# ip address 100.100.1.1/32
switch(config-if)# ip router ospf 100 area 0.0.0.0
switch(config-if)# ip pim sparse-mode
```

The IP address must be the same on all distributed anchor DRs.

Step 7 Configure multicast routing to override the source-interface on every TRM-enabled VTEP (Anchor DR).

Example:

```
switch(config-if)# interface nve1
switch(config-if-nve)# mcast-routing override source-interface loopback 10
```

The *loopback10* variable must be configured on every TRM-enabled VTEP (Anchor DR) in the underlay with the same IP address. This loopback and the respective **override** command are needed to serve TRM VTEPs in co-existence with non-TRM VTEPs.

Step 8 Configure BGP for multicast VPN and send extended communities and set route-targets.

Example:

```
switch(config)# router bgp 100
switch(config-router)# neighbor 1.1.1.1
switch(config-router-neighbor)# address-family ipv4 mvpn
switch(config-router-neighbor-af)# send-community extended
switch(config-vrf-af-ipv4)# route-target both auto mvpn
```

Step 9 Configure Layer 2/Layer 3 VNI VLAN interfaces with IP, PIM, and anycast gateway settings.

Example:

```
switch(config)# interface vlan11  ! Layer 2 VNI
switch(config-if)# vrf member vrf100
switch(config-if)# ip address 11.1.1.1/24
switch(config-if)# ip pim sparse-mode
switch(config-if)# fabric forwarding mode anycast-gateway
switch(config-if)# ip pim neighbor-policy route-map1
switch(config-if)# exit
switch(config)# interface vlan100   !Layer 3 VNI
switch(config-if)# vrf member vrf100
switch(config-if)# ip forward
switch(config-if)# ip pim sparse-mode
switch(config-if)# exit
switch(config)# vrf context vrf100
switch(config-vrf)# ip pim rp-address 209.165.201.1 group-list 226.0.0.0/8
switch(config-vrf)# address-family ipv4 unicast
```

For overlay RP placement options, see the Options for rendezvous points in TRM deployments , on page 8.

To prevent PIM neighborship on the L2VNI SVI, create an IP PIM neighbor policy with a suitable route map to deny IPv4 addresses.

Ensure that the same RP IP address and group range are configured on all VXLAN VTEPs to enable a fully distributed RP.

Tenant Routed Multicast is enabled in Layer 2/Layer 3 mixed mode, allowing multicast traffic forwarding between senders and receivers across the fabric and external Layer 3 networks.

Configure Layer 2 Tenant Routed Multicast

Before you begin

VXLAN EVPN must be configured.

TRM allows multicast traffic optimization by signaling Layer 2 multicast routes. This procedure activates TRM features and configures IGMP snooping querier settings on required switches.

Follow these steps to configure Layer 2 Tenant Routed Multicast:

Before you begin

- VXLAN EVPN must be configured.
- You must configure IGMP snooping querier per multicast-enabled VXLAN VLAN on all Layer-2 TRM leaf switches.

Procedure

Step 1 Enter configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enable the EVPN/MVPN feature.

Example:

```
switch(config)# feature ngmvpn
```

Step 3 Advertise Layer 2 multicast capability for EVPN.

Example:

```
switch(config)# advertise evpn multicast
```

Step 4 Enable IGMP snooping for VXLANs.

Example:

```
switch(config)# ip igmp snooping vxlan
```

Step 5 Enter VLAN configuration mode for each multicast-enabled VXLAN VLAN.

Example:

```
switch(config)# vlan configuration 101
```

Step 6 Configure the IGMP snooping querier by specifying its IP address for each relevant VLAN.

Example:

```
switch(config-vlan-config)# ip igmp snooping querier 2.2.2.2
```

TRM is enabled with Layer 2 multicast and IGMP snooping querier configured, ensuring proper multicast routing and signaling within the VXLAN EVPN fabric.

Configure TRM with vPC support

You can onfigure TRM Multisite with vPC support on Cisco NX-OS. Beginning with Cisco NX-OS Release 10.1(2), TRM Multisite with vPC BGW is supported.

Follow these steps to configure TRM with vPC support:

Procedure

Step 1 Enter global configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enable required features:

Example:

```
switch(config)# feature vpc
switch(config)# feature interface-vlan
switch(config)# feature lacp
switch(config)# feature pim
switch(config)# feature ospf
```

Step 3 Configure PIM RP address for the multicast group range:

Example:

```
switch(config)# ip pim rp-address 100.100.100.1 group-list 224.0.0/4
```

Step 4 Configure the vPC domain and basic vPC parameters.

Example:

```
switch(config)# vpc domain 1
switch(config-vpc-domain)# peer switch
switch(config-vpc-domain)# peer gateway
switch(config-vpc-domain)# peer-keepalive destination 172.28.230.85
```

There is no default for vPC domain. The range is from 1 to 1000.

To enable Layer 3 forwarding for packets destined to the gateway MAC address of the virtual port channel (vPC), use the **peer-gateway** command.

The **peer-keepalive destination** *ipaddress* command configures the IPv4 address for the remote end of the vPC peer-keepalive link.

Note
The system does not form the vPC peer link until you configure a vPC peer-keepalive link.

The management ports and VRF are the defaults.

Note
We recommend that you configure a separate VRF and use a Layer 3 port from each vPC peer device in that VRF for the vPC peer-keepalive link.

For more information about creating and configuring VRFs, see the Cisco Nexus 9000 NX-OS Series Unicast Routing Config Guide, 9.3(x).

Step 5 (Optional) Set the delay restore timer for SVIs as needed.

Example:

```
switch(config-vpc-domain)# delay restore interface-vlan 45
```

We recommend tuning this value when the SVI/VNI scale is high. For example, when the SCI count is 1000, we recommend that you set the delay restore for **interface-vlan** to 45 seconds.

Step 6 Enable ARP and IPv6 ND synchronization for faster recovery.

Example:

```
switch(config-vpc-domain)# ip arp synchronize
switch(config-vpc-domain)# ipv6 nd synchronize
```

Step 7 Create the vPC peer-link port-channel interface and add member interfaces.

Example:

```
switch(config)# interface port-channel 1
                        switch(config)# switchport
                        switch(config)# switchport mode trunk
                        switch(config)# switchport trunk allowed vlan 1,10,100-200
                        switch(config)# mtu 9216
                        switch(config)# vpc peer-link
                        switch(config)# no shut

                        switch(config)# interface Ethernet 1/1, 1/21
                        switch(config)# switchport
                        switch(config)# mtu 9216
                        switch(config)# channel-group 1 mode active
                        switch(config)# no shutdown
```

Step 8 Define the infra-VLAN and create the required VLAN.

Example:

```
switch(config)# system nve infra-vlans 10
switch(config)# vlan 10
```

Step 9 Configure the SVI for the infra-VLAN and enable underlay routing.

Example:

```
switch(config)# interface vlan 10
switch(config)# ip address 10.10.10.1/30
switch(config)# ip router ospf process UNDERLAY area 0
switch(config)# ip pim sparse-mode
switch(config)# no ip redirects
switch(config)# mtu 9216
switch(config)# no shutdown
```

Configure TRM with vPC support on Cisco Nexus 9504-R and 9508-R switches

Use this task when deploying VXLAN TRM in a vPC topology on Cisco Nexus 9504-R and 9508-R switches equipped with -R line cards.

Follow these steps to configure TRM with vPC support:

Before you begin

- Ensure you have access to a Cisco Nexus 9504-R or 9508-R switch with -R line cards.
- Back up your running configuration.

Procedure

Step 1 Enter global configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Enable the following features: vPC, interface VLAN, LACP, PIM, and OSPF.

Example:

```
switch(config)# feature vpc
switch(config)# feature interface-vlan
switch(config)# feature lacp
switch(config)# feature pim
switch(config)# feature ospf
```

Step 3 Define the PIM RP address for the multicast group range.

Example:

```
switch(config)# ip pim rp-address 100.100.100.1 group-list 224.0.0/4
```

Step 4 (Optional) Set the delay restore timer for SVIs as needed.

Example:

```
switch(config-vpc-domain)# delay restore interface-vlan 45
```

Enables the delay restore timer for SVIs. We recommend tuning this value when the SVI/VNI scale is high. For example, when the SCI count is 1000, we recommend that you set the delay restore for **interface-vlan** to 45 seconds.

Step 5 Carve TCAM regions for TRM and VXLAN as required for N9K-X9636C-RX line cards only and reload the switch.

Example:

```
switch(config)# hardware access-list tcam region mac-ifacl 0  ! For TRM
switch(config)# hardware access-list tcam region vxlan 10   ! For VXLAN
switch(config)# reload
```

Note
This TCAM carving command is required to enable TRM forwarding for N9K-X9636C-RX line cards only. With no TCAM region carved for **mac-ifacl**, the TCAM resources are used for TRM instead.

Step 6 Configure the vPC domain and vPC peer options.

a) Create and configure the vPC domain.

Example:

```
switch(config)# vpc domain 1
```

There is no default. The range is 1–1000.

b) Set peer switch and peer gateway.

Example:

```
switch(config-vpc-domain)# peer switch
switch(config-vpc-domain)# peer gateway
```

To enable Layer 3 forwarding for packets that are destined to the gateway MAC address of the virtual port channel (vPC), use the **peer-gateway** command.

c) Specify peer-keepalive destination IP.

Example:

```
switch(config-vpc-domain)# peer-keepalive destination 172.28.230.85
```

Configures the IPv4 address for the remote end of the vPC peer-keepalive link.

Note
The system does not form the vPC peer link until you configure a vPC peer-keepalive link.

The management ports and VRF are the defaults.

Note
We recommend that you configure a separate VRF and use a Layer 3 port from each vPC peer device in that VRF for the vPC peer-keepalive link.

For more information about creating and configuring VRFs, see the Cisco Nexus 9000 NX-OS Series Unicast Routing Config Guide, 9.3(x).

Step 7 Enable ARP and IPv6 ND synchronization for faster recovery.

Example:

```
switch(config-vpc-domain)# ip arp synchronize
switch(config-vpc-domain)# ipv6 nd synchronize
```

Step 8 Create the vPC peer-link and assign member interfaces. **ip arp synchronize**

Example:

```
switch(config)# interface port-channel 1
switch(config)# switchport
switch(config)# switchport mode trunk
switch(config)# switchport trunk allowed vlan 1,10,100-200
switch(config)# mtu 9216
switch(config)# vpc peer-link
switch(config)# no shut

switch(config)# interface Ethernet 1/1, 1/21
switch(config)# switchport
switch(config)# mtu 9216
switch(config)# channel-group 1 mode active
switch(config)# no shutdown
```

Step 9 Create the infra-VLAN and associated SVI for the backup routed path over the vPC peer-link.

Example:

```
switch(config)# system nve infra-vlans 10
switch(config)# vlan 10
```

```
switch(config)# interface vlan 10
switch(config)# ip address 10.10.10.1/30
switch(config)# ip router ospf process UNDERLAY area 0
switch(config)# ip pim sparse-mode
switch(config)# no ip redirects
switch(config)# mtu 9216
switch(config)# no shutdown
```