VXLAN EVPN and TRM with IPv6 Multicast Underlay

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This chapter contains the following sections:

Information About Configuring VXLAN EVPN and TRM with IPv6 Multicast Underlay

Cisco NX-OS Release 10.3(99w)F supports VXLAN with IPv6 Multicast in the Underlay. Hosts in the overlay can be IPv4 or IPv6. This requires IPv6 versions of the unicast routing protocols and utilizing IPv6 multicast in the underlay (PIMv6). Any multi-destination overlay traffic (such as TRM, BUM) can use the IPv6 multicast underlay.

Figure 1.   **Topology – VXLAN EVPN with IPv6 Multicast Underlay**
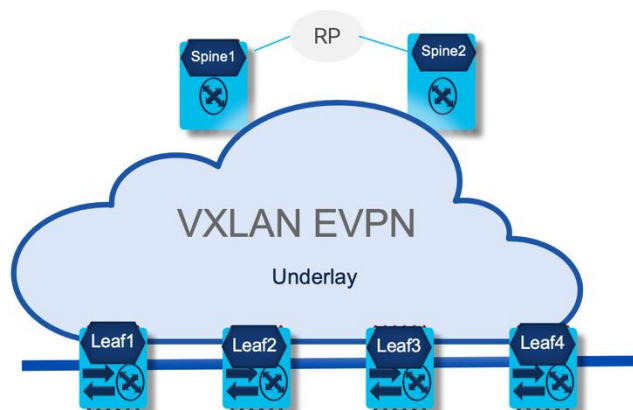
The above topology shows four leafs and two spines in a VXLAN EVPN fabric. The underlay is IPv6 Multicast running PIMv6. RP is positioned in the spine with anycast RP.

Guidelines and Limitations for VXLAN EVPN and TRM with IPv6 Multicast Underlay

VXLAN EVPN and TRM with IPv6 Multicast Underlay has the following guidelines and limitations:

- Spine-based static RP is supported in underlay.

- PIMv6 ASM (sparse mode) is supported in underlay.

- Underlay IPv6 Multicast is supported.

- For overlay traffic, each Cisco Nexus 9000 leaf is an RP.

Configuring VXLAN EVPN and TRM with IPv6 Multicast Underlay

Configuring IPv6 multicast underlay in the VXLAN fabric involves the following:

- Configuring L2-VNI based multicast group in underlay.
- Configuring L3-VNI based multicast group in underlay.
- Enabling PIMv6 for underlay.

Configuring L2-VNI based multicast group in underlay:

Under NVE configuration on a leaf, IPv6 multicast group (IPv6) is configured for each L2-VNI (VLAN).

SUMMARY STEPS

1. configure terminal
2. interface nve1
3. member vni *<vni>*
4. mcast-group ipv6-prefix
5. exit

DETAILED STEPS
Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `switch# `**`configure terminal`**	Enter configuration mode.
Step 2	**interface nve1** **Example:** `switch(config)# `**`interface nve 1`**	Configure the NVE interface.
Step 3	**member vni** *<vni>* **Example:** `switch(config-if-nve)# `**`member vni 10501`**	Configure the Layer 2 virtual network identifier.
Step 4	**mcast-group** *ipv6-prefix* **Example:** `switch(config-if-nve-vni)# `**`mcast-group ff10::1`**	Builds the default multicast distribution tree for the Layer 2 VNI.
Step 5	**exit** **Example:** `switch(config-if-nve-vni)# `**`exit`**	Exits the command mode.

Configuring L3-VNI based multicast group in underlay:

IPv6 multicast group (IPv6) is configured for each L3-VNI (VRF).

SUMMARY STEPS

1. configure terminal

2. interface nve1

3. member vni <*vni*> associate-vrf

4. mcast-group <*ipv6-prefix*>

5. exit

DETAILED STEPS
Procedure

	Command or Action	**Purpose**
Step 1	**configure terminal** **Example:** switch# **configure terminal**	Enter configuration mode.
Step 2	**interface nve1** **Example:** switch(config)# **interface nve 1**	Configure the NVE interface.
Step 3	**member vni** *vni* **associate-vrf** **Example:** switch(config-if-nve)# **member vni 50001** **associate-vrf**	Associates L3VNI to VRF.
Step 4	**mcast-group** *ipv6-prefix* **Example:** switch(config-if-nve-vni)# **mcast-group** **ff10:0:0:1::1**	Builds the default multicast distribution tree for the VRF VNI (Layer 3 VNI used for TRM).
Step 5	**exit** **Example:** switch(config-if-nve-vni)# **exit**	Exits command mode.

Enabling PIMv6 for underlay:

PIMv6 in underlay is configured as follows:

SUMMARY STEPS

1. configure terminal

2. interface loopback <*number*>

3. ipv6 address <*ipv6-prefix*>

4. ipv6 pim sparse-mode

5. interface nve1

6. source-interface loopback <*number*>

7. exit

DETAILED STEPS
Procedure

	Command or Action	**Purpose**
Step 1	**configure terminal**	Enters global configuration mode.

	Command or Action	Purpose
	Example: switch# **configure terminal**	
Step 2	**interface loopback** *number* **Example:** switch(config)# **interface loopback 1**	Configures an interface loopback. This example configures interface loopback 1.
Step 3	**ipv6 address** *ipv6-prefix* **Example:** switch(config-if)# **ipv6 address** **11:0:0:1::1/128**	Configures an IP address for this interface. It should be a unique IP address that helps to identify this router.
Step 4	**ipv6 pim sparse-mode** Example: switch(config-if)# **ipv6 pim sparse-** **mode**	Enable PIM6 sparse mode.
Step 5	**interface nve1** **Example:** switch(config-if-nve)# **interface nve** **1**	Configure the NVE interface.
Step 6	**source-interface loopback** *number* **Example:** switch(config-if-nve)# **source-** **interface loopback 1**	Configures an source interface loopback.
Step 7	**exit** **Example:** switch(config-if-nve)# **exit**	Exits command mode.

Note:
For the PIMv6 configuration see the *Cisco Nexus 9000 Series NX-OS Multicast Routing Configuration Guide, Release 10.3(x)*.

For the TRM configuration see the *Cisco Nexus 9000 Series NX-OS VXLAN Configuration Guide, Release 10.3(x)*.

Example Configuration for VXLAN EVPN and TRM with IPv6 Multicast Underlay

In the following section, the sample configuration for the leaf, spine and RP are shown.

Leaf - sample configuration of IPv6 multicast underlay:

 NVE Configuration

```
interface nve1
  no shutdown
  host-reachability protocol bgp
  source-interface loopback1
  member vni 10501
    mcast-group ff10::1
  member vni 50001 associate-vrf
    mcast-group ff10:0:0:1::1
```

PIMv6 Configuration

```
feature pim6

ipv6 pim rp-address 101:101:101:101::101 group-list ff00::/8

interface loopback1
  ipv6 address 172:172:16:1::1/128
  ipv6 pim sparse-mode

interface Ethernet1/27
  ipv6 address 27:50:1:1::1/64
  ospfv3 hello-interval 1
  ipv6 router ospfv3 v6u area 0.0.0.0
  ipv6 pim sparse-mode
  no shutdown
```

BGP Configuration

```
router bgp 100
  router-id 172.16.1.1
  timers bgp 1 3
  bestpath as-path multipath-relax
  reconnect-interval 1
  address-family ipv4 unicast
    maximum-paths 64
    maximum-paths ibgp 64
  address-family ipv6 unicast
    maximum-paths 64
    maximum-paths ibgp 64
  address-family ipv4 mvpn
    retain route-target all
  address-family l2vpn evpn
    maximum-paths mixed 64
    retain route-target all
  neighbor 172:17:1:1::1
    remote-as 100
    update-source loopback0
    address-family ipv4 mvpn
      allowas-in 3
      send-community
      send-community extended
    address-family ipv6 mvpn
      allowas-in 3
      send-community
      send-community extended
    address-family l2vpn evpn
      allowas-in 3
      send-community
      send-community extended
  neighbor 172:17:2:2::1
    remote-as 100
```

```
      update-source loopback0
      address-family ipv4 mvpn
        allowas-in 3
        send-community
        send-community extended
      address-family ipv6 mvpn
        allowas-in 3
        send-community
        send-community extended
      address-family l2vpn evpn
        allowas-in 3
        send-community
        send-community extended
  vrf VRF1
    reconnect-interval 1
    address-family ipv4 unicast
      network 150.1.1.1/32
      advertise l2vpn evpn
      redistribute hmm route-map hmmAdv
evpn
  vni 10501 l2
    rd auto
    route-target import auto
    route-target export auto
vrf context VRF1
  rd auto
  address-family ipv4 unicast
    route-target both auto
    route-target both auto mvpn
    route-target both auto evpn
```

Spine - sample configuration of IPv6 multicast underlay:

NVE Configuration

```
nv overlay evpn
```

PIMv6 Configuration

```
feature pim6

ipv6 pim rp-address 101:101:101:101::101 group-list ff00::/8
ipv6 pim anycast-rp 101:101:101:101::101 102:102:102:102::102
ipv6 pim anycast-rp 101:101:101:101::101 103:103:103:103::103

interface loopback101
  ipv6 address 101:101:101:101::101/128
  ipv6 router ospfv3 v6u area 0.0.0.0
  ipv6 pim sparse-mode

interface loopback102
  ipv6 address 102:102:102:102::102/128
  ipv6 router ospfv3 v6u area 0.0.0.0
  ipv6 pim sparse-mode

interface Ethernet1/50/1
  ipv6 address 27:50:1:1::2/64
  ipv6 pim sparse-mode
  no shutdown
```

BGP Configuration

```
feature ngmvpn

router bgp 100
  router-id 172.17.1.1
  timers bgp 1 3
  bestpath as-path multipath-relax
  reconnect-interval 1
  address-family ipv4 unicast
    maximum-paths 64
    maximum-paths ibgp 64
  address-family ipv6 unicast
    maximum-paths 64
    maximum-paths ibgp 64
  address-family ipv4 mvpn
    retain route-target all
  address-family l2vpn evpn
    maximum-paths mixed 64
    retain route-target all
  neighbor 172:16:1:1::1
    remote-as 100
    update-source loopback0
    address-family ipv4 mvpn
      allowas-in 3
      send-community
      send-community extended
      route-reflector-client
      route-map permitall out
    address-family ipv6 mvpn
      allowas-in 3
      send-community
      send-community extended
      route-reflector-client
      route-map permitall out
    address-family l2vpn evpn
      allowas-in 3
      send-community
      send-community extended
      route-reflector-client
      route-map permitall out
```

Verifying VXLAN EVPN and TRM with IPv6 Multicast Underlay

The following example is used to verify the status of the IPv6 Multicast Underlay configuration.

```
switch(config)# show run interface nve 1

!Command: show running-config interface nve1
!Running configuration last done at: Wed Jul  5 10:03:58 2023
!Time: Wed Jul  5 10:04:01 2023
version 10.3(99w) Bios:version 01.08

interface nve1
  no shutdown
  host-reachability protocol bgp
  source-interface loopback1
  member vni 10501
    mcast-group ff10::1
```

```
    member vni 50001 associate-vrf
      mcast-group ff10:0:0:1::1
```

Use the following command for verifying PIMv6 ASM configuration:

```
switch(config)# show ipv6 mroute
IPv6 Multicast Routing Table for VRF "default"

(*, ff10::1/128), uptime: 05:20:19, nve pim6 ipv6
  Incoming interface: Ethernet1/36, RPF nbr: fe80::23a:9cff:fe23:8367
  Outgoing interface list: (count: 1)
    nve1, uptime: 05:20:19, nve


(172:172:16:1::1/128, ff10::1/128), uptime: 05:20:19, nve m6rib pim6 ipv6
  Incoming interface: loopback1, RPF nbr: 172:172:16:1::1
  Outgoing interface list: (count: 2)
    Ethernet1/36, uptime: 01:47:03, pim6
    Ethernet1/27, uptime: 04:14:20, pim6


(*, ff10:0:0:1::10/128), uptime: 05:20:18, nve ipv6 pim6
  Incoming interface: Ethernet1/36, RPF nbr: fe80::23a:9cff:fe23:8367
  Outgoing interface list: (count: 1)
    nve1, uptime: 05:20:18, nve


(172:172:16:1::1/128, ff10:0:0:1::10/128), uptime: 05:20:18, nve m6rib ipv6
pim6
  Incoming interface: loopback1, RPF nbr: 172:172:16:1::1
  Outgoing interface list: (count: 2)
    Ethernet1/36, uptime: 04:04:35, pim6
    Ethernet1/27, uptime: 04:13:35, pim6

switch(config)# show ipv6 pim neighbor
PIM Neighbor Status for VRF "default"
Neighbor                     Interface          Uptime    Expires   DR
Bidir-  BFD     ECMP Redirect
                                                                    Priority
Capable State   Capable
fe80::23a:9cff:fe28:5e07     Ethernet1/27       20:23:38  00:01:44  1
yes     n/a     no
  Secondary addresses:
    27:50:1:1::2


switch(config)# show ipv6 pim rp
PIM RP Status Information for VRF "default"
BSR disabled
BSR RP Candidate policy: None
BSR RP policy: None

RP: 101:101:101:101::101, (0),
 uptime: 21:30:43   priority: 255,
 RP-source: (local),
 group ranges:
 ff00::/8
```