Configurazione e verifica della VXLAN con MP-BGP VPN Control Plane

Sommario

Introduzione

Questo documento descrive la configurazione VXLAN con il control-plane MP-BGP EVPN.

Prerequisiti

Requisiti

Cisco raccomanda la conoscenza dei seguenti argomenti:

- VPN MPLS layer 3
- Anche MP-BGP sarebbe d'aiuto.

Componenti usati

Il documento può essere consultato per tutte le versioni software o hardware.

Le informazioni discusse in questo documento fanno riferimento a dispositivi usati in uno specifico ambiente di emulazione. Su tutti i dispositivi menzionati nel documento la configurazione è stata ripristinata ai valori predefiniti. Se la rete è operativa, valutare attentamente eventuali conseguenze derivanti dall'uso dei comandi.

Premesse

Questo documento mostra anche uno scenario di rete di esempio e la sua configurazione con output rilevanti per la verifica e la migliore comprensione.

VXLAN è progettato per fornire la virtualizzazione della rete. MAC in incapsulamento UDP. L'infrastruttura di layer 2 viene estesa sulla rete sottostante di layer 3 per fornire un servizio semplificato che non dipende dalla posizione fisica e geografica dei server nei centri dati.

Questo documento descrive la VXLAN con MP-BGP VPN Control Plane. Ciò significa che il protocollo BGP viene utilizzato nell'infrastruttura di overlay per inviare e ricevere gli aggiornamenti.

Nelle installazioni di rete tradizionali è stato utilizzato il protocollo STP, con il risultato che alcuni uplink bloccavano in modo permanente lo stato. Nella progettazione VXLAN, tutti gli uplink sono operativi e l'ECMP è utilizzato come infrastruttura sottostante la rete IP.

La discussione di tutti i dettagli esula dall'ambito del presente documento, tuttavia di seguito sono riportate alcune terminologie importanti.

VXLAN - LAN estendibile virtuale

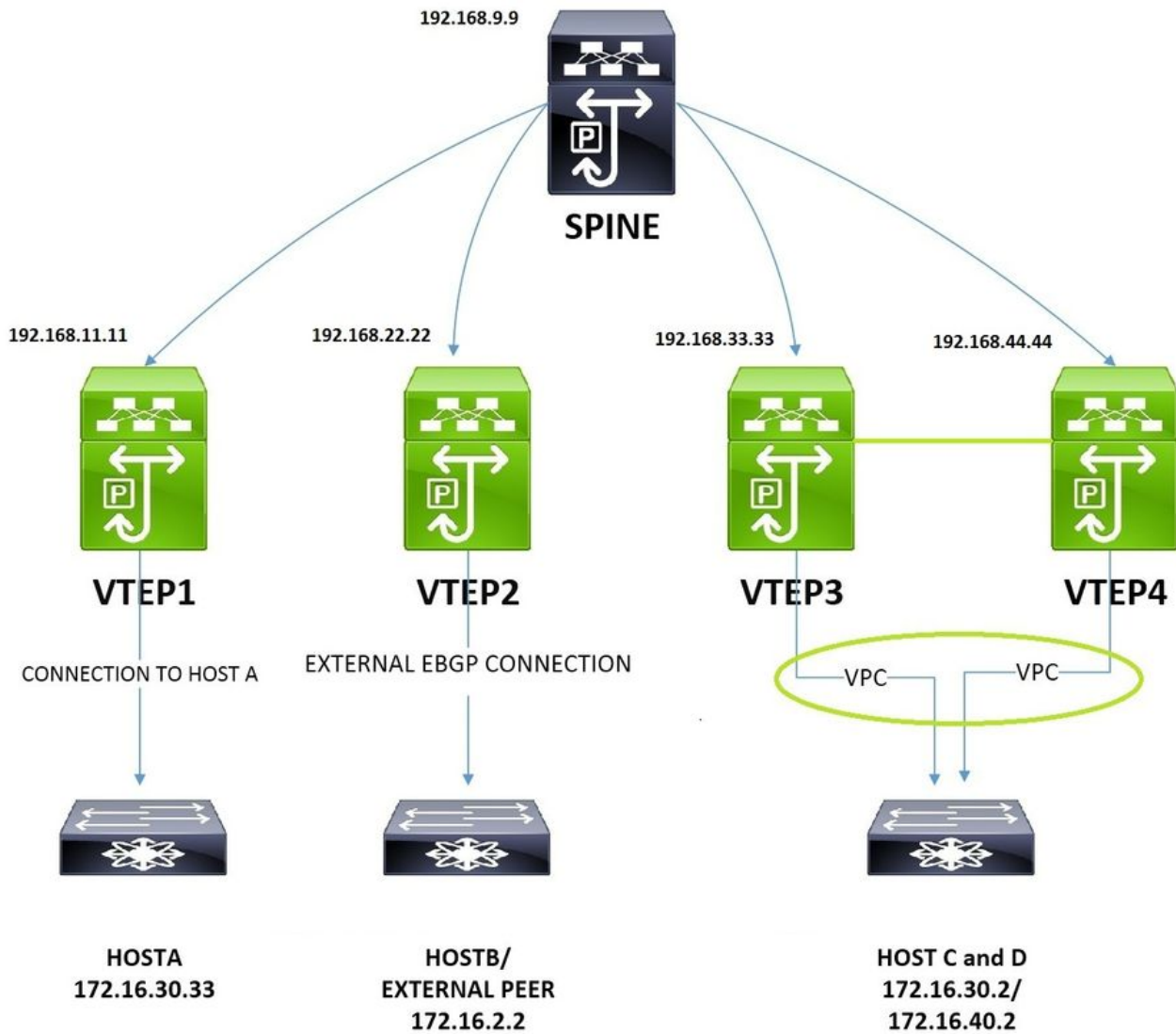MP-BGP - BGP multiprotocollo

EVPN - VPN Ethernet

VTEP - Endpoint del tunnel virtuale. Noto anche come foglia. In questo modo, i pacchetti vengono incapsulati e decapsulati.

Spine - È molto simile a Route-Reflector nelle VPN MPLS L3. Questo dispositivo riceve gli aggiornamenti da un VTEP e li passa ad un altro VTEP.

VNI - VXLAN Network Identifier. Viene utilizzato principalmente per isolare i contorni del layer 2. La lunghezza di questo campo è 24 bit, quindi supera il limite di intervallo delle vlan tradizionali. Una VNI in un VTEP è mappata su una vlan tradizionale. Questo argomento verrà discusso in seguito.

Configurazione

Esempio di rete

L'immagine mostrata viene utilizzata per gli aspetti di configurazione e verifica. In questo documento vengono illustrate le configurazioni di connettività non vpc, vpc, intra-vni, inter-vni e esterne dal punto di vista dell'infrastruttura VXLAN.

Configurazione

VTEP1

<#root>

```
!


Enabling features


nv overlay evpn
feature ospf
feature bgp
feature pim
```

```
feature interface-vlan
feature vn-segment-vlan-based
feature lacp
feature vpc
feature nv overlay

!

fabric forwarding anycast-gateway-mac 0001.0001.0001

!
```

This is needed for seamless VM mobility across VTEPS,

this configuration is same on all VTEPS.

```
ip pim rp-address 192.168.9.9 group-list 224.0.0.0/4
```

! SPINE is the RP.

```
!
ip pim ssm range 232.0.0.0/8

!
vlan 1,10,30,40,100,200

!
vlan 10

 !
```

VLAN 10 is used as layer3 VNI to route Inter-VNI traffic.

```
 name L3-VNI-VLAN-10
 vn-segment 10000010
 vlan 30
```

! The Host A resides on Vlan 30, The below command 'maps' vlan 30 with VNID 10000030.

```
 vn-segment 10000030
!
vrf context EVPN-L3-VNI-VLAN-10
```

! Defining layer3 vrf for Inter-VNI traffic.

```
 vni 10000010
 rd auto
 address-family ipv4 unicast
 route-target both auto
 route-target both auto evpn

!

interface Vlan10
```

! Layer3 VNI associated interface vlan does not have an ip address.

```
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip forward

!

interface Vlan30

 ! Associating the Host A Vlan with layer3 vrf.


 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip address 172.16.30.1/24
 fabric forwarding mode anycast-gateway

!



This is needed for seamless VM mobility across VTEPS, same on all VTEPS.



!

interface nve1

! Nve is logical interface where VXLAN packets are encapsulated and decapsulated.


 no shutdown
 source-interface loopback2
 host-reachability protocol bgp

! This means BGP control plane is used to exchange updates.


 member vni 10000010 associate-vrf

! associate-vrf is used for for layer3 vni.


 member vni 10000030
 suppress-arp
 mcast-group 239.1.1.10

 ! A vlan or set of vlans mapped to VNI can be given identical multicast address, this is used for contr


!

interface Ethernet1/2

 ! Ospf with PIM is used as Underlay.


 description "Going to Spine"
 no switchport
 ip address 192.168.19.1/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown

!
```

```
interface Ethernet1/11
```
! Port to Host A.

```
 switchport mode trunk
!
interface loopback2 !
```
Loopback for BGP Peering.

```
 description "Loopback for "BGP"
 ip address 192.168.11.11/32
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
!
router ospf UNDERLAY
!
router bgp 65000
 address-family ipv4 unicast
 address-family l2vpn evpn
 neighbor 192.168.9.9
```
!

Peering with SPINE.

```
 remote-as 65000
 update-source loopback2
 address-family ipv4 unicast
 address-family l2vpn evpn
 send-community extended
 vrf EVPN-L3-VNI-VLAN-10
 address-family ipv4 unicast
 advertise l2vpn evpn
!
evpn
 vni 10000030 l2
 rd auto
```
! RD is default calculated as VNI:BGP Router ID

```
 route-target import auto
```
! RT is default calculated as BGP AS:VNI

```
 route-target export auto
```

VTEP2

```
<#root>

!

nv overlay evpn
feature ospf
feature bgp
feature pim
feature interface-vlan
feature vn-segment-vlan-based
feature lacp
feature vpc
feature nv overlay

!

fabric forwarding anycast-gateway-mac 0001.0001.0001

!
ip pim rp-address 192.168.9.9 group-list 224.0.0.0/4

!
ip pim ssm range 232.0.0.0/8
vlan 1,10,30,40,100

!
vlan 10

! This VTEP is dedicated for external connectivity, there is only layer3 VNI config.


 name L3-VNI-VLAN-10
 vn-segment 10000010

!

vrf context EVPN-L3-VNI-VLAN-10

! Defining layer3 vrf for Inter-VNI traffic.


 vni 10000010
 rd auto
 address-family ipv4 unicast
 route-target both auto
 route-target both auto evpn

!

interface Vlan10

! Layer3 VNI associated interface vlan does not have an ip address.


 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip forward

!

interface Vlan100

! This vlan is used to peer with external EBGP Peer.
```

```
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip address 192.168.1.2/24

!

interface nve1
 no shutdown
 source-interface loopback2
 host-reachability protocol bgp
 member vni 10000010 associate-vrf

!

interface Ethernet1/2

! Ospf and PIM are used in Underlay.


 description "Going to Spine"
 no switchport
 ip address 192.168.29.2/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown

!

interface Ethernet1/12

! Port to External Peer.


 switchport mode trunk

!

interface loopback2
 ip address 192.168.22.22/32
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode

!

router ospf UNDERLAY

!
router bgp 65000
 address-family ipv4 unicast
 address-family l2vpn evpn
 neighbor 192.168.9.9

! Peering with SPINE.


 remote-as 65000
 update-source loopback2
 address-family ipv4 unicast
 address-family l2vpn evpn
 send-community extended
 vrf EVPN-L3-VNI-VLAN-10
 address-family ipv4 unicast
 advertise l2vpn evpn
```

```
 neighbor 192.168.1.1
```

! Peering with External Peer, under vrf.

```
 remote-as 65111
 update-source Vlan100
 address-family ipv4 unicast
```

VTEP3

Le configurazioni per VTEP3 e VTEP1 sono quasi identiche. L'unica differenza è il VPC e un VNI di layer 2 aggiuntivo per la vlan 40.

<#root>

```
!

nv overlay evpn
feature ospf
feature bgp
feature pim
feature interface-vlan
feature vn-segment-vlan-based
feature lacp
feature vpc
feature nv overlay

!

fabric forwarding anycast-gateway-mac 0001.0001.0001

!
ip pim rp-address 192.168.9.9 group-list 224.0.0.0/4

!
ip pim ssm range 232.0.0.0/8

!
vlan 1,10,20,30,40

!
vlan 10
 name L3-VNI-VLAN-10
 vn-segment 10000010

!
vlan 30
 vn-segment 10000030

!
vlan 40
```

!

New host vlan 40.

```
  vn-segment 10000040

!

vpc domain 2

! Vpc Configs.

  peer-keepalive destination 10.197.204.103 source 10.197.204.106

!

interface Vlan10
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip forward

!

interface Vlan30
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip address 172.16.30.1/24

!
 fabric forwarding mode anycast-gateway

!

interface Vlan40
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip address 172.16.40.1/24

!
 fabric forwarding mode anycast-gateway

!

interface port-channel2
 switchport mode trunk
 vpc 2

!

interface port-channel34
 switchport mode trunk
 spanning-tree port type network
 vpc peer-link

!

interface nve1
 no shutdown
 source-interface loopback2
 host-reachability protocol bgp
 member vni 10000010 associate-vrf
 member vni 10000030
 suppress-arp
 mcast-group 239.1.1.10
 member vni 10000040
```

!

New layer2 VNI for Vlan 40.

 suppress-arp
 mcast-group 239.1.1.20

!

interface Ethernet1/1

! Connected to VTEP4.

 switchport mode trunk
 channel-group 34 mode active

!

interface Ethernet1/2
 description "going to Spine"
 no switchport
 ip address 192.168.39.3/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown

!

interface Ethernet1/13

! Connected to N5K, which simulates Host C and D.

 switchport mode trunk
 channel-group 2 mode active

!

interface loopback2
 description "loopback for Bgp"
 ip address 192.168.33.33/32
 ip address 192.168.33.34/32 secondary

!

For other VTEPs VTEP3 and VTEP4 look as single entity.

 ip router ospf UNDERLAY area 0.0.0.0

!

This secondary address is needed in Vpc designs.

!

router ospf UNDERLAY

!
router bgp 65000

```
 address-family ipv4 unicast
 address-family l2vpn evpn
 neighbor 192.168.9.9 remote-as 100
 remote-as 65000
 update-source loopback2
 address-family ipv4 unicast
 address-family l2vpn evpn
 send-community extended
 vrf EVPN-L3-VNI-VLAN-10
 address-family ipv4 unicast
 advertise l2vpn evpn

!
evpn
 vni 10000030 l2
 rd auto
 route-target import auto
 route-target export auto
 vni 10000040 l2
 rd auto
 route-target import auto
 route-target export auto
```

VTEP4

<#root>

```
!

nv overlay evpn
feature ospf
feature bgp
feature pim
feature interface-vlan
feature vn-segment-vlan-based
feature lacp
feature vpc
feature nv overlay

!

fabric forwarding anycast-gateway-mac 0001.0001.0001

!
ip pim rp-address 192.168.9.9 group-list 224.0.0.0/4

!
ip pim ssm range 232.0.0.0/8

!
vlan 1,10,20,30,40

!
vlan 10
 name L3-VNI-VLAN-10
 vn-segment 10000010

!
```

```
vlan 30
 vn-segment 10000030

!
vlan 40
 vn-segment 10000040

!
vrf context EVPN-L3-VNI-VLAN-10
 vni 10000010
 rd auto
 address-family ipv4 unicast
 route-target both auto
 route-target both auto evpn

!

interface Vlan10
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip forward

!

interface Vlan30
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip address 172.16.30.1/24

!
 fabric forwarding mode anycast-gateway

!

interface Vlan40
 no shutdown
 vrf member EVPN-L3-VNI-VLAN-10
 ip address 172.16.40.1/24

!
 fabric forwarding mode anycast-gateway

!

interface port-channel2
 switchport mode trunk
 vpc 2

!

interface port-channel34
 switchport mode trunk
 spanning-tree port type network
 vpc peer-link

!

interface nve1
 no shutdown
 source-interface loopback2
 host-reachability protocol bgp
 member vni 10000010 associate-vrf
```

```
  member vni 10000030
  suppress-arp
  mcast-group 239.1.1.10
  member vni 10000040
  suppress-arp
  mcast-group 239.1.1.20

!

interface Ethernet1/1

! Connected to VTEP3.


  switchport mode trunk
  channel-group 34 mode active

!

interface Ethernet1/2
 description "going to spine"
 no switchport
 ip address 192.168.49.4/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown

!

interface Ethernet1/13

! Connected to N5K, which simulates Host C and D.


  switchport mode trunk
  channel-group 2 mode active

!

router ospf UNDERLAY

!
router bgp 65000
 address-family ipv4 unicast
 address-family l2vpn evpn
 neighbor 192.168.9.9 remote-as 100
 remote-as 65000
 update-source loopback2
 address-family ipv4 unicast
 address-family l2vpn evpn
 send-community extended
 vrf EVPN-L3-VNI-VLAN-10
 address-family ipv4 unicast
 advertise l2vpn evpn

!
evpn
 vni 10000030 l2
 rd auto
 route-target import auto
 route-target export auto
 vni 10000040 l2
 rd auto
```

```
 route-target import auto
 route-target export auto
```

DORSO

<#root>

```
!

nv overlay evpn
feature ospf
feature bgp
feature pim
feature interface-vlan
feature vn-segment-vlan-based
feature lacp
feature vpc
feature nv overlay

!
ip pim rp-address 192.168.9.9 group-list 224.0.0.0/4

!
ip pim ssm range 232.0.0.0/8

!

interface Ethernet1/1
```

! To VTEP1.

```
 ip address 192.168.19.9/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown
```

```
!

interface Ethernet1/2
```

! To VTEP2.

```
 ip address 192.168.29.9/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown
```

```
!

interface Ethernet1/3
```

! To VTEP3.

```
 ip address 192.168.39.9/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
```

```
 no shutdown

!

interface Ethernet1/4
```
! To VTEP4.

```
 ip address 192.168.49.9/24
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode
 no shutdown

!

interface loopback1
```
! SPINE is RP(Rendezvous Point).

```
 ip address 192.168.9.9/32
 ip router ospf UNDERLAY area 0.0.0.0
 ip pim sparse-mode

!

router ospf UNDERLAY

!
router bgp 65000
 log-neighbor-changes
 address-family ipv4 unicast
 address-family l2vpn evpn
 retain route-target all
 template peer VTEP-PEERS
 remote-as 65000
 update-source loopback1
 address-family ipv4 unicast
 send-community both
 route-reflector-client
```
! Spine treats VTEPs as Route-Reflector Clients.

```
 address-family l2vpn evpn
 send-community both
 route-reflector-client
 neighbor 192.168.11.11
```
! VTEP1.

```
 inherit peer VTEP-PEERS
 neighbor 192.168.22.22
```
! VTEP2.

```
 inherit peer VTEP-PEERS
 neighbor 192.168.33.33
```
! VTEP3.

```
 inherit peer VTEP-PEERS
 neighbor 192.168.44.44
```

! VTEP4.

```
 inherit peer VTEP-PEERS
```

HOST A

L'host A è simulato da uno switch 3750.

<#root>

```
! This port is the uplink to VTEP1.

interface GigabitEthernet1/0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk

!

interface Vlan30
 ip address 172.16.30.33 255.255.255.0

!
```

! Below the default route to VTEP1.

```
ip route 0.0.0.0 0.0.0.0 172.16.30.1
```

HOST B

L'host B è il dispositivo peer esterno. N5K è usato qui.

<#root>

```
!

router bgp 65111
 address-family ipv4 unicast

!
 network 172.16.2.2/32

!
```

Advertsing the external subnet to VXLAN infrastructure.

```
 neighbor 192.168.1.2 remote-as 65000
```

```
!
```

```
 address-family ipv4 unicast

!

interface loopback1
 ip address 172.16.2.2/32

!

interface Ethernet1/19

!
```

```
 switchport mode trunk

!

interface Vlan100
 no shutdown
 ip address 192.168.1.1/24
```

HOST C e D

Gli host C e D vengono simulati da Nexus5k, mantenendo gli indirizzi IP in vrf distinti.

<#root>

```
!

vrf context vni30

!
```

This vrf simulates the HOST C.

```
 ip route 0.0.0.0/0 172.16.30.1
vrf context vni40
```

! This vrf simulates the HOST D.

```
 ip route 0.0.0.0/0 172.16.40.1

!

interface Vlan30
```

! Addressing for HOST C.

```
 no shutdown
vrf member vni30
 ip address 172.16.30.2/24


!

interface Vlan40

! Addressing for HOST D.


 no shutdown
 vrf member vni40
 ip address 172.16.40.2/24


!

interface Ethernet1/20

! Uplink port to VTEP3 in Port-Channel.


 switchport mode trunk
 channel-group 2 mode active


!

interface Ethernet1/21

! Uplink port to VTEP4 in Port-Channel.


 switchport mode trunk
 channel-group 2 mode active< /pre>
```

Verifica

Connettività dall'host A all'host esterno B

```
HOST_A#ping 172.16.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/9 ms
```

Connettività dall'host A all'host C (Intra-VNI)

```
HOST_A#ping 172.16.30.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.30.2, timeout is 2 seconds:
!!!!!
```

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/9 ms

Connettività dall'host A all'host D (Inter-VNI)

```
HOST_A#ping 172.16.40.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.40.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms
```

Tabella di routing dell'host B (peer esterno)

<#root>

```
N5K-5672-1# show ip route bgp
IP Route Table for VRF "default"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

172.16.30.2/32, ubest/mbest: 1/0, pending
```

! Host route for Host C.

```
 *via 192.168.1.2, [20/0], 00:00:22, bgp-65100, external, tag 65000,
172.16.30.33/32, ubest/mbest: 1/0, pending
```

! Host route for Host A.

```
 *via 192.168.1.2, [20/0], 00:00:22, bgp-65100, external, tag 65000,
172.16.40.2/32, ubest/mbest: 1/0, pending
```

! Host route for Host D.

```
 *via 192.168.1.2, [20/0], 00:00:22, bgp-65100, external, tag 65000,
```

È possibile osservare che le route host sono state annunciate correttamente a questo peer BGP esterno.

Verifica del Control-Plane

- Questo comando mostra il mapping delle vlan tradizionali con i VNID.

```
 VTEP1# show vxlan
Vlan VN-Segment
==== ==========
10 10000010
30 10000030
40 10000040
```

- Il successivo consiste nel verificare che il mac venga appreso localmente sul VTEP.

<#root>

```
 VTEP1# show mac address-table vlan 30
Legend:
 * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
 age - seconds since last seen,+ - primary entry using vPC Peer-Link,
 (T) - True, (F) - False
 VLAN MAC Address Type age Secure NTFY Ports
---------+----------------+--------+---------+------+----+-----------------
```

*

```
 30 0006.f63f.e3c1 dynamic 0 F F Eth1/11 ! Mac of HOST A
* 30 8c60.4ff2.f541 dynamic 0 F F nve1(192.168.33.34)
```

! Mac of HOST C installed into mac address table, it was learned from BGP.

```
G 30 e00e.da2a.2393 static - F F sup-eth1(R)
```

- Il passaggio successivo consiste nel verificare che il percorso sia installato in l2rib.

<#root>

```
 VTEP1# show l2route evpn mac evi 30
Mac Address Prod Next Hop (s)
-------------- ------ ---------------
```

0006.f63f.e3c1

```
 Local Eth1/11
```

! Mac of HOST A

```
 i
```

nstalled into l2rib.

8c60.4ff2.f541

```
 BGP 192.168.33.34
```

! Mac of HOST C installed into l2rib learnt via BGP.

<#root>

```
VTEP1# show l2route evpn
```

mac-ip

```
 evi 30
Mac Address Prod Host IP Next Hop (s)
-------------- ---- -------------------------------------- --------------
0006.f63f.e3c1 HMM 172.16.30.33 N/A
```

8c60.4ff2.f541

```
 BGP
```

172.16.30.2

```
 192.168.33.34
```

! Mac+IP of Host C learnt across the Vxlan Fabric.

<#root>

```
VTEP1# show l2route evpn
```

mac-ip

```
 evi 40
Mac Address Prod Host IP Next Hop (s)
-------------- ---- -------------------------------------- --------------
```

8c60.4ff2.f541

```
 BGP
```

172.16.40.2

```
 192.168.33.34
```

! Mac+IP of Host D learnt across the Vxlan Fabric.

- Il passaggio successivo consiste nel verificare che l2rib esporti l'aggiornamento in l2vpn evpn.

```
 VTEP1# show bgp l2vpn evpn vni-id 10000030
BGP routing table information for VRF default, address family L2VPN EVPN
BGP table version is 31, local router ID is 192.168.11.11
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-i
njected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup
```

<#root>

```
Network Next Hop Metric LocPrf Weight Path
```

```
Route Distinguisher: 192.168.11.11:32797 (L2VNI 10000030)


*>l[2]:[0]:[0]:[48]:[

0006.f63f.e3c1

]:[0]:[0.0.0.0]/216

!



Mac of Host A in update.


 192.168.11.11 100 32768 i
*>i[2]:[0]:[0]:[48]:[8c60.4ff2.f541]:[0]:[0.0.0.0]/216
 192.168.33.34 100 0 i
* i 192.168.33.34 100 0 i
*>l[2]:[0]:[0]:[48]:[

0006.f63f.e3c1

]:[32]:[

172.16.30.33

]/272

!



Mac and IP of Host A in update.


 192.168.11.11 100 32768 i
* i[2]:[0]:[0]:[48]:[

8c60.4ff2.f541

]:[32]:[

172.16.30.2

]/272

!

Mac and IP of Host C in update from

Spine.


 192.168.33.34 100 0 i
*>i 192.168.33.34 100 0 i
```

- Il passaggio successivo consiste nel controllare che le route vengano annunciate a Spine.


```
 VTEP1# show bgp l2vpn evpn nei 192.168.9.9 advertised-routes

Peer 192.168.9.9 routes for address family L2VPN EVPN:
BGP table version is 31, local router ID is 192.168.11.11
```

```
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-i
njected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup
```

<#root>

```
 Network Next Hop Metric LocPrf Weight Path
```

Route Distinguisher: 192.168.11.11:32797 (L2VNI 10000030)

```
*>l[2]:[0]:[0]:[48]:[0006.f63f.e3c1]:[0]:[0.0.0.0]/216
 192.168.11.11 100 32768 i
*>l[2]:[0]:[0]:[48]:[
```

0006.f63f.e3c1

]:[32]:[

172.16.30.33

]/272

! Mac and IP advertised to Spine.

```
 192.168.11.11 100 32768 i
```

- Il passaggio successivo consiste nel controllare le route ricevute da Spine.

<#root>

```
 VTEP1# show bgp l2vpn evpn nei 192.168.9.9 routes

Peer 192.168.9.9 routes for address family L2VPN EVPN:
BGP table version is 31, local router ID is 192.168.11.11
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-i
njected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup

Network Next Hop Metric LocPrf Weight Path
Route Distinguisher: 192.168.11.11:32797 (L2VNI 10000030)
*>i[2]:[0]:[0]:[48]:[8c60.4ff2.f541]:[0]:[0.0.0.0]/216
 192.168.33.34 100 0 i
* i 192.168.33.34 100 0 i
* i[2]:[0]:[0]:[48]:[
```

8c60.4ff2.f541

]:[32]:[

172.16.30.2

]/272

! This is update from Host C in same VNID.

```
 192.168.33.34 100 0 i
*>i 192.168.33.34 100 0 i

Route Distinguisher: 192.168.11.11:32807 (L2VNI 10000040)
*>i[2]:[0]:[0]:[48]:[8c60.4ff2.f541]:[0]:[0.0.0.0]/216
 192.168.33.34 100 0 i
* i 192.168.33.34 100 0 i
* i[2]:[0]:[0]:[48]:[
```

8c60.4ff2.f541

]:[32]:[

172.16.40.2

]/272

!

This is update from Host D in different VNID.

```
 192.168.33.34 100 0 i
*>i 192.168.33.34 100 0 i

Route Distinguisher: 192.168.11.11:3 (L3VNI 10000010)
*>i[2]:[0]:[0]:[48]:[8c60.4ff2.f541]:[32]:[172.16.30.2]/272
 192.168.33.34 100 0 i
* i 192.168.33.34 100 0 i
*>i[2]:[0]:[0]:[48]:[8c60.4ff2.f541]:[32]:[172.16.40.2]/272
 192.168.33.34 100 0 i
* i 192.168.33.34 100 0 i
*>i[5]:[0]:[0]:[32]:[
```

172.16.2.2

]:[0.0.0.0]/224 !

! This is update from External Host.

```
 192.168.22.22 100 0 65100 i
```

<#root>

VTEP1# show ip bgp vrf

EVPN-L3-VNI-VLAN-10

```
BGP routing table information for VRF EVPN-L3-VNI-VLAN-10, address family IPv4 Unicast
BGP table version is 5, local router ID is 192.168.1.254
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup

Network          Next Hop Metric LocPrf Weight    Path
*>i
```

172.16.2.2/32

```
   192.168.22.22   100      0        65111 i
*>i
```

172.16.30.2/32

```
  192.168.33.34   100     0        i
* i               192.168.33.34  100     0        i
*>i
```

172.16.40.2/32

```
  192.168.33.34   100     0        i
* i               192.168.33.34  100     0        i
```

- Nel VTEP1, è configurato solo il VNID 1000030 ed è stato verificato che mac e ip dell'host A vengano appresi a livello locale e pubblicizzati anche come route evpn. È stato anche osservato che l'aggiornamento dall'host C è stato ricevuto e installato qui.

- I peer nve possono essere attivi anche prima dell'inoltro del traffico.

<#root>

```
VTEP1# show nve peers
Interface Peer-IP State LearnType Uptime Router-Mac
--------- --------------- ----- --------- -------- -----------------
nve1
```

192.168.22.22

```
 Up CP 01:39:15 0062.ecbf.5325
```

!

VTEP2

```
nve1
```

192.168.33.34

```
 Up CP 01:40:09 f8c2.8823.275f
```

!

VTEP3 and VTEP4 appear as single entity as both are in Vpc.

<#root>

```
VTEP1# sh bgp internal nve-peer-vni
PeerAddress VNI VrfID   GatewayMAC     TunnelID Encap EgressVNI F
```

192.168.22.22

 10000010 1

0062.ecbf.5325

0xc0a81616

 1   0   0

192.168.33.34

 10000010 1

0062.ecbf.4e4d

0xc0a82122

 1   0   0
192.168.33.34 10000010 1 f8c2.8823.275f 0xc0a82122 1   0   0
192.168.33.34 10000030 1 0000.0000.0000 0x0   1   0   0
192.168.33.34 10000040 1 0000.0000.0000 0x0   1   0   0

Risoluzione dei problemi

- Se si controlla la nuova interfaccia, è possibile visualizzare gli incrementi dei contatori per l'incapsulamento e la decapsulamento.

<#root>

```
 VTEP1# show interface nve 1
nve1 is up
admin state is up, Hardware: NVE
```

MTU 9216 bytes

```
 Encapsulation VXLAN
 Auto-mdix is turned off
 RX
 ucast: 133 pkts, 22344 bytes - mcast: 0 pkts, 0 bytes
 TX
 ucast: 134 pkts, 22512 bytes - mcast: 0 pkts, 0 bytes
```

- Se per il filtraggio viene utilizzato un firewall trasparente, verificare che la porta associata sia consentita.

<#root>

```
VTEP1# show nve vxlan-params
```

VxLAN Dest. UDP Port: 4789

- Per controllare l'indirizzo MAC VTEP locale utilizzato per il routing tra VNI. L'indirizzo secondario viene visualizzato quando il VTEP è in una coppia VPC.

<#root>

```
 VTEP1# show nve interface
Interface: nve1, State: Up, encapsulation: VXLAN
 VPC Capability: VPC-VIP-Only [not-notified]
```

Local Router MAC: e00e.da2a.2393

```
 Host Learning Mode: Control-Plane
```

Source-Interface: loopback2 (primary: 192.168.11.11, secondary: 0.0.0.0)

- Per controllare gli indirizzi MAC VTEPS remoti e lo stato del peering.

<#root>

```
VTEP1# sh nve internal platform interface nve1 detail
Printing Interface ifindex 0x49000001 detail
|======|======================|==============|==============|=====|=====|
|Intf |State |PriIP |SecIP |Vnis |Peers|
|======|======================|==============|==============|=====|=====|
|nve1 |UP |192.168.11.11 |
```

0.0.0.0

```
 |3 |2 | !
```

 Secondary Ip is 0.0.0.0 because this VTEP is not in vpc

```
|======|======================|==============|==============|=====|=====|
```

```
SW_BD/VNIs of interface nve1:
=================================================
|======|======|======================|======|====|======|========
|Sw BD |Vni |State |Intf |Type|Vrf-ID|Notified
|======|======|======================|======|====|======|========
|
```

10 |10000010|UP |nve1 |CP |3 |Yes

|30 |10000030|UP |nve1 |CP |0 |Yes

```
|
```

```
40 |10000040|UP |nve1 |CP |0 |Yes


|======|======|========================|======|====|======|========

Peers of interface nve1:
========================================

Peer_ip: 192.168.22.22
 Peer-ID : 1
 State : UP
 Learning : Disabled
 TunnelID : 0xc0a81616


MAC : 0062.ecbf.5325


 Table-ID : 0x1
 Encap : 0x1

Peer_ip: 192.168.33.34 ! For both VTEP3 and VTEP4
 Peer-ID : 2
 State : UP
 Learning : Disabled
 TunnelID : 0xc0a82122


MAC : 0062.ecbf.4e4d


 Table-ID : 0x1
 Encap : 0x1
```

- Per controllare il tempo di peering e le informazioni VNI per i peer VTEP.

```
 VTEP1# show nve peer detail
Details of nve Peers:
----------------------------------------

Peer-Ip: 192.168.22.22
 NVE Interface : nve1
 Peer State : Up
 Peer Uptime : 00:22:17

Router-Mac : 0062.ecbf.5325
 Peer First VNI : 10000010
 Time since Create : 00:22:17

Configured VNIs : 10000010,10000030,10000040
 Provision State : add-complete ! Hardware ready for forwarding.
 Route-Update : Yes
 Peer Flags : RmacL2Rib, TunnelPD, DisableLearn
 Learnt CP VNIs : 10000010
 Peer-ifindex-resp : Yes
----------------------------------------
Peer-Ip: 192.168.33.34
 NVE Interface : nve1
 Peer State : Up
```

```
Peer Uptime : 00:22:10
Router-Mac : 0062.ecbf.4e4d
Peer First VNI : 10000010
Time since Create : 00:22:10
Configured VNIs : 10000010,10000030,10000040
Provision State : add-complete ! Hardware ready for forwarding.
Route-Update : Yes
Peer Flags : RmacL2Rib, TunnelPD, DisableLearn
Learnt CP VNIs : 10000010,10000030,10000040
Peer-ifindex-resp : Yes
----------------------------------------
```

- Per verificare come BGP interagisce con EVI e le informazioni interne sono costruite. Di seguito è riportato un esempio di vlan 30 mappata alla VNI 1000030.

<#root>

VTEP1#

sh bgp internal evi 10000030


```
**************************************************
L2RIB bound / VNI Req to L2RIB : Yes / 1
L2VNI Adds / Dels / ALL Dels from L2RIB : 4 / 3 / 1
 First L2VNI Add/Del : Dec 17 19:07:41.680736 / Dec 17 19:10:48.455562
 Last L2VNI Add/Del : Dec 17 19:11:13.916893 / Dec 17 19:10:48.455792
L3VNI Adds / Dels from L2RIB : 2 / 0 / 1
 First L3VNI Add/Del : Dec 17 19:07:41.681313 / never
 Last L3VNI Add/Del : Dec 17 19:11:11.838315 / never
 First/Last All VNI Del : Dec 17 19:10:48.455542 / Dec 17 19:10:48.455543
ALL VNI Del from L2RIB state (cleanup status) : All VNI Not Start (0x000006)
All VNI down loop count : 0
L2RIB is up/registered/local-req: 1/1
L2RIB down: in-prg/up-defer: 0/0
L2RIB register/failures: 1/0
L2RIB deregister/failures: 0/0
L2RIB flow control (#enabled/#disabled): Disabled (0/0)
**************************************************
```

BGP L2VPN/EVPN RD Information for 192.168.11.11:32797


```
 L2VNI ID : 10000030 (evi_10000030)
 #Prefixes Local/BRIB : 2 / 4
 #Paths L3VPN->EVPN/EVPN->L3VPN : 129 / 0
**************************************************
=============================================
BGP Configured VNI Information:
 evi_cfg : 0xd87786c8
```

 VNI ID (Index) : 10000030

 (1)

 RD : 192.168.11.11:32797

 Export RTs : 1

```
ExportRT cfg list:
65000:10000030 (auto)
Import RTs : 1
ImportRT cfg list:
65000:10000030 (auto)
Topo Id : 30

VTEP IP : 192.168.11.11


VTEP VPC IP : 0.0.0.0
Encap Type : 8
Refcount : #00000003

Enabled : Yes ! If this is no then check the NVE interface config for this VNID


Delete Pending : No
Creation Req : No
Future RD : NULL
evi_ctx : 0xd86e554c
RD/Import RT/Export RT : Yes(Auto)/Yes/Yes
MAC First Add/Del : Dec 17 19:11:12.45086 / never
MAC Last Add/Del : Dec 17 19:11:12.45086 / never
MAC IP First Add/Del : Dec 17 19:11:12.54976 / never
MAC IP Last Add/Del : Dec 17 19:11:12.54977 / never
IMET First Add/Del : never / never
IMET Last Add/Del : never / never

===============================================
+++++++++++++++++++++++++++++++++++++++++++++
BGP VNI Information for evi_10000030 (0xd86e554c)
 L2VNI ID : 10000030 (evi_10000030)
 RD (rdinfo) : 192.168.11.11:32797 (0xd8811eb0)
 Prefixes (local/total) : 2/4
 Created : Dec 17 19:11:12.37640
 Last Oper Up/Down : Dec 17 19:11:12.37827 / never
 Enabled : Yes
 Delete pending : 0
 Stale : No
 Import pending : 0
 Import in progress : 0
 Encap : VxLAN
 Topo Id : 30
 VTEP IP : 192.168.11.11
 VTEP VPC IP : 0.0.0.0
Router-MAC : 0000.0000.0000
 Active Export RTs : 1

 Active Export RT list : 65000:10000030


 Config Export RTs : 1
 ExportRT cfg list:
 65000:10000030 (auto)
 Export RT chg/chg-pending : 0/0
 Active Import RTs : 1

 Active Import RT list : 65000:10000030


 Config Import RTs : 1
 ImportRT cfg list:
```

```
65000:10000030 (auto)
Import RT chg/chg-pending : 0/0
IMET Reg/Unreg from L2RIB : 2/0
MAC Reg/Unreg from L2RIB : 2/0
MAC IP Reg/Unreg from L2RIB : 2/0
IMET Add/Del from L2RIB : 0/0
MAC Add/Del from L2RIB : 1/0
MAC IP Add/Del from L2RIB : 1/0
IMET Dnld/Wdraw to L2RIB : 0/0
MAC Dnld/Wdraw to L2RIB : 1/0
MAC IP Dnld/Wdraw to L2RIB : 1/0
```

- Quando si riceve un aggiornamento, indipendentemente dal fatto che si tratti di un aggiornamento tra VNI o tra VNI, accertarsi che siano state ricevute le Route Targets (RT) corrette e che il VTEP che riceve l'aggiornamento disponga delle configurazioni appropriate. Un aggiornamento del VTEP3 in arrivo tramite SPINE è analizzato qui per la coerenza RT. In questi output è stato mostrato lo stato locale di RT e RD per VTEP1.
  <#root>

  ```
  SPINE# show bgp l2vpn evpn 172.16.30.2 !
  ```

  Update from Spine

  ```
  BGP routing table information for VRF default, address family L2VPN EVPN
  Route Distinguisher: 3.3.3.3:32797
  BGP routing table entry for [2]:[0]:[0]:[48]:[8c60.4ff2.f541]:[32]:[172.16.30.2]
  /272, version 25
  Paths: (1 available, best #1)
  Flags: (0x000202) on xmit-list, is not in l2rib/evpn, is not in HW,

  Advertised path-id 1
   Path type: internal, path is valid, is best path, remote nh not installed, no
  labeled nexthop
   AS-Path: NONE, path sourced internal to AS
   192.168.33.34 (metric 5) from 192.168.33.33 (3.3.3.3)
   Origin IGP, MED not set, localpref 100, weight 0
   Received label 10000030 1000001
  ```

  Extcommunity: RT:65000:10000010 RT:65000:10000030 SOO:192.168.33.34:0 ENC

  ```
  AP:8 Router MAC:0062.ecbf.4e4d

  Path-id 1 advertised to peers:
  ```

  192.168.11.11 192.168.22.22 192.168.44.44