

透過 MP-BGP EVPN 控制平面組態和驗證 VXLAN。

目錄

[簡介](#)

[必要條件](#)

[需求](#)

[採用元件](#)

[背景資訊](#)

[設定](#)

[網路圖表](#)

[組態](#)

[VTEP1](#)

[VTEP2](#)

[VTEP3](#)

[VTEP4](#)

[骨幹](#)

[主機 A](#)

[主機 B](#)

[主機 C 和 D](#)

[驗證](#)

[從主機 A 連線到外部主機 B](#)

[從主機 A 連線到主機 C \(VNI 內 \)](#)

[從主機 A 連線到主機 D \(VNI 間 \)](#)

[主機 B 的路由表 \(外部對等點 \)](#)

[驗證控制平面。](#)

[疑難排解](#)

簡介

本檔案介紹使用MP-BGP EVPN控制平面的VXLAN組態。說明範例網路情境及其組態，並附上相關輸出以進行驗證和更清楚瞭解。

必要條件

需求

思科建議您瞭解以下主題：

- MPLS 第 3 層 VPN
- MP-BGP 肯定會有所幫助。

採用元件

本文件所述內容不限於特定軟體和硬體版本。

本文件所述內容不限於特定軟體和硬體版本。本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路正在作用，請確保您已瞭解任何指令可能造成的影響。

背景資訊

VXLAN 的用途是提供網路虛擬化。它是 UDP 封裝中的 MAC。第 2 層基礎架構是第 3 層底層網路的延伸，提供的簡化服務獨立於資料中心內何服务器的實體和地理位置。

本文件介紹使用 MP BGP EVPN 控制平面的 VXLAN。這表示在重疊基礎架構中，BGP 通訊協定用於傳送和接收更新項目。

在使用 STP 的傳統網路部署中，這會導致某些上行鏈路處於永久封鎖狀態。在 VXLAN 設計中，所有上行鏈路都是可操作的，而 ECMP 用於作為 IP 網路的底層網路基礎架構。

所討論的所有詳細資訊超出本文件的範圍，但是以下列出一些重要的術語。

VXLAN - 虛擬可擴充 LAN。

MP-BGP — 多重通訊協定BGP。

EVPN — 乙太網路VPN。

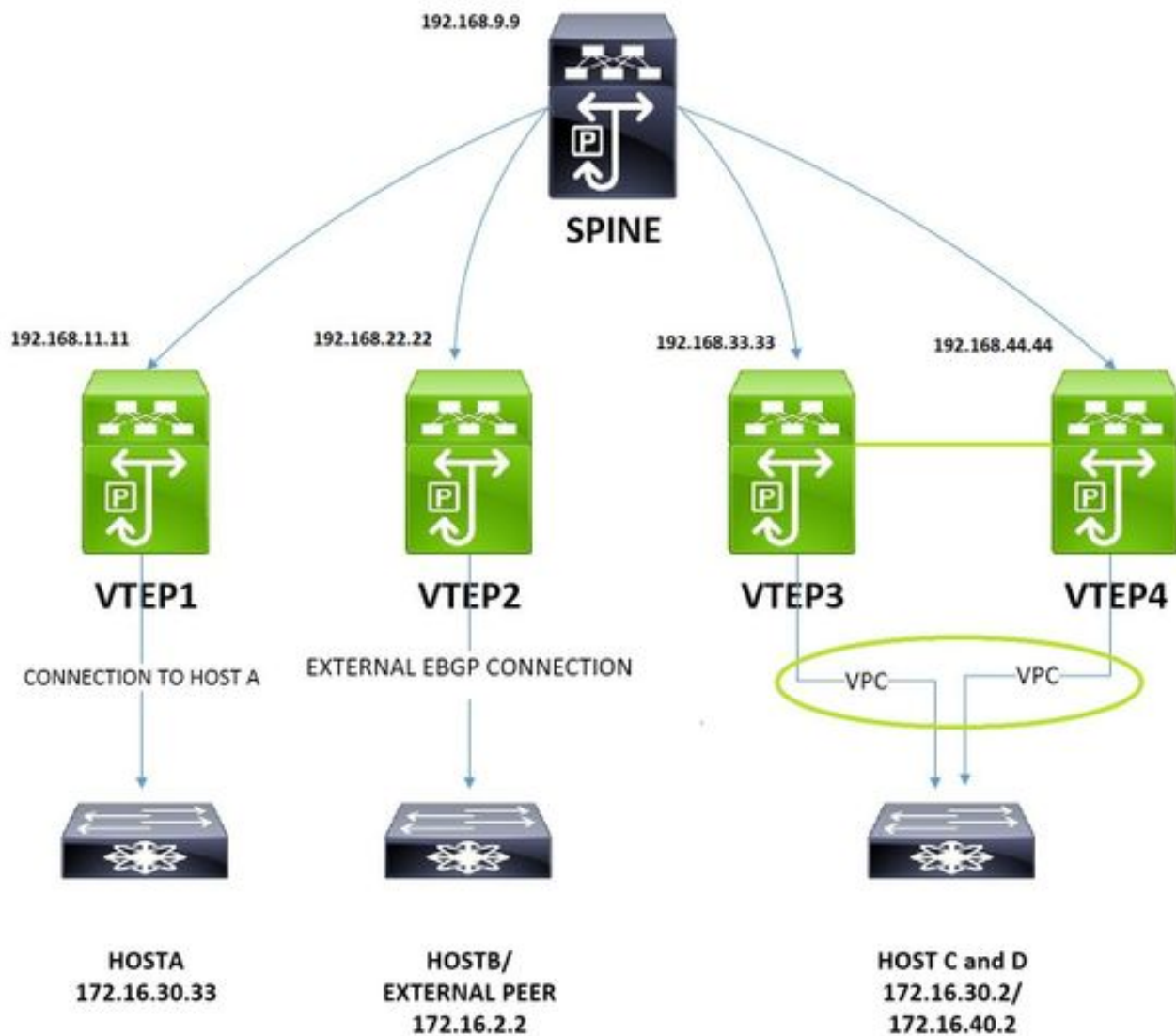
VTEP — 虛擬通道端點。也稱為分葉。這是將封包封裝和解除封裝的地方。

骨幹 - 這與 MPLS L3 VPN 中的路由反射程式非常相似。此裝置可從某個 VTEP 取得更新項目，然後傳遞到其他 VTEP 上。

VNI - VXLAN 網路識別碼。這主要用於為第 2 層邊界提供隔離。此欄位的長度為 24 位，因此克服了傳統 VLAN 的範圍限制。VTEP 中的 VNI 會「對應」到傳統 VLAN。稍後將對此進行討論。

設定

網路圖表



展示的影響用於組態和驗證方面。從 VXLAN 基礎架構角度來看，這涵蓋非 VPC、VPC、VNI 內、VNI 間和外部連線組態。

組態

VTEP1

! 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 controlled flooding of arp requests.
!
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

```
!
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

VTEP3 和 VTEP1 的組態幾乎完全相同。唯一的區別是 VPC，以及 VLAN 40 的一個額外第 2 層 VNI。

```

!
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 will 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

```

!
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
```

骨幹

```
!
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

```

主機 A

主機 A 由 3750 交換器模擬。

```

! 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

```

主機 B

主機 B 是外部對等裝置，此處使用 N5K。

```

!
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 ! EBGP Peering with VTEP2.
address-family ipv4 unicast
!
interface loopback1
ip address 172.16.2.2/32

```

```
!  
interface Ethernet1/19 ! Uplink port to VTEP2.  
switchport mode trunk  
!  
interface Vlan100  
no shutdown  
ip address 192.168.1.1/24
```

主機 C 和 D

主機 C 和 D 由 Nexus5k 模擬，將 IP 位址保留在不同的 VRF 中。

```
!  
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>
```

驗證

從主機 A 連線到外部主機 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
```

從主機 A 連線到主機 C (VNI 內)

```
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
```

從主機 A 連線到主機 D (VNI 間)

```
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
```

主機 B 的路由表 (外部對等點)

```
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,
```

可以觀察到，已成功向此外部 BGP 對等點通告主機路由。

驗證控制平面。

- 此指令會顯示使用 VNID 的傳統 VLAN 之「對應」。

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

- 下一步是檢查是否於 VTEP 本機上得知 MAC。

```
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)
```

- 下一步是檢查是否已將路由安裝到 I2rib 中。

```
VTEP1# show l2route evpn mac evi 30
Mac Address Prod Next Hop (s)
-----
0006.f63f.e3c1 Local Eth1/11 ! Mac of HOST A installed into l2rib.
8c60.4ff2.f541 BGP 192.168.33.34 ! Mac of HOST C installed into l2rib learnt via BGP.
```

```
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.
```

```
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.
```

- 下一步是檢查 I2rib 是否將更新項目匯出至 I2vpn 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
```

```
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
```

- 下一步是檢查是否已向骨幹通告路由。

```
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
```

```
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
```

- 下一步是檢查所收到來自骨幹的路由。

```
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

```

```

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
*>i172.16.2.2/32  192.168.22.22 100      0      65111 i
*>i172.16.30.2/32 192.168.33.34 100      0      i
* i              192.168.33.34 100      0      i
*>i172.16.40.2/32 192.168.33.34 100      0      i
* i              192.168.33.34 100      0      i

```

- VTEP1 中僅設定了 VNID 10000030，且已驗證是於本機得知主機 A 的 MAC 和 IP，也已通告為 EVPN 路由。此外還觀察到，已收到來自主機 C 的更新項目並在此處安裝。
- NVE 對等點也應處於開啟狀態才能轉送流量。

```

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.

```

```

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

```

疑難排解

- 如果勾選了 NVE 介面，那麼應該會看到封裝和解除封裝的計數增加。

```
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
```

- 如果使用透明防火牆進行過濾，請確保允許相關聯的連接埠。

```
VTEP1# show nve vxlan-params
VxLAN Dest. UDP Port: 4789
```

- 檢查用於 VNI 間路由的本機 VTEP MAC 位址。VTEP 位於 VPC 配對中時，會看到次要位址。

```
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)
```

- 檢查遠端 VTEP MAC 位址和對等狀態。

```
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

- 檢查 VTEP 對等點的對等時間和 VNI 資訊。

```
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  
-----
```

- 檢查 BGP 如何與 EVI 互動，以及如何建構內部資訊。以下為對應到 VNI 10000030 的 VLAN 30 範例。

```
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
```

- 收到更新項目時，無論它是 VNI 間或 VNI 內更新項目，都需確保收到的 RT（路由目標）正確無誤，且收到更新項目的 VTEP 具有相關組態。來自 VTEP3 的更新項目將在這裡進行分析，以確保 RT 一致性。VTEP1 的 RT 和 RD 的本機狀態已顯示在上方輸出中。

```
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
```