設定 VXLAN

目錄

簡介

本檔案將簡要概述虛擬可擴充區域網路(VXLAN)和組態範例，以及驗證指令和輸出。

必要條件

需求

思科建議您瞭解以下主題：

- 多點傳送路由概念，例如集結點 (RP) 和平台無關多點傳送 (PIM)。
- 虛擬連接埠通道 (vPC) 概念。

本文件假設在設定 VXLAN 之前已建立 IP 路由和多點傳送路由。

採用元件

本文中的資訊係根據以下軟體和硬體版本：

- 執行 7.0(3)I1(1b) 版的 Nexus 9396s，作為 vPC 虛擬通道端點 (VTEP)
- 執行 6.0(2)U5(1) 版的 Nexus 3172
- 已安裝 LAN_ENTERPRISE_SERVICES_PKG 授權

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。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

背景資訊

技術

VXLAN（虛擬可擴充區域網路）- 此技術提供的乙太網路第 2 層網路服務與現今 VLAN 提供的如出一轍，但具有更高的擴充性和靈活性。

VNID（VXLAN 網路識別碼）- 用於定義廣播網域的 24 位元區段 ID。可與「VXLAN 區段 ID」互換。

VTEP（虛擬通道端點） - 這是負責執行封裝和解除封裝的裝置。

NVE（網路虛擬介面）- 進行封裝和解除封裝的邏輯介面。

什麼是VXLAN

- VXLAN技術可使用任何IP路由通訊協定，在第3層(L3)底層上重疊第2層(L2)網路。
- 此技術採用 UDP 內 MAC 封裝。

VXLAN 解決了三個主要問題：

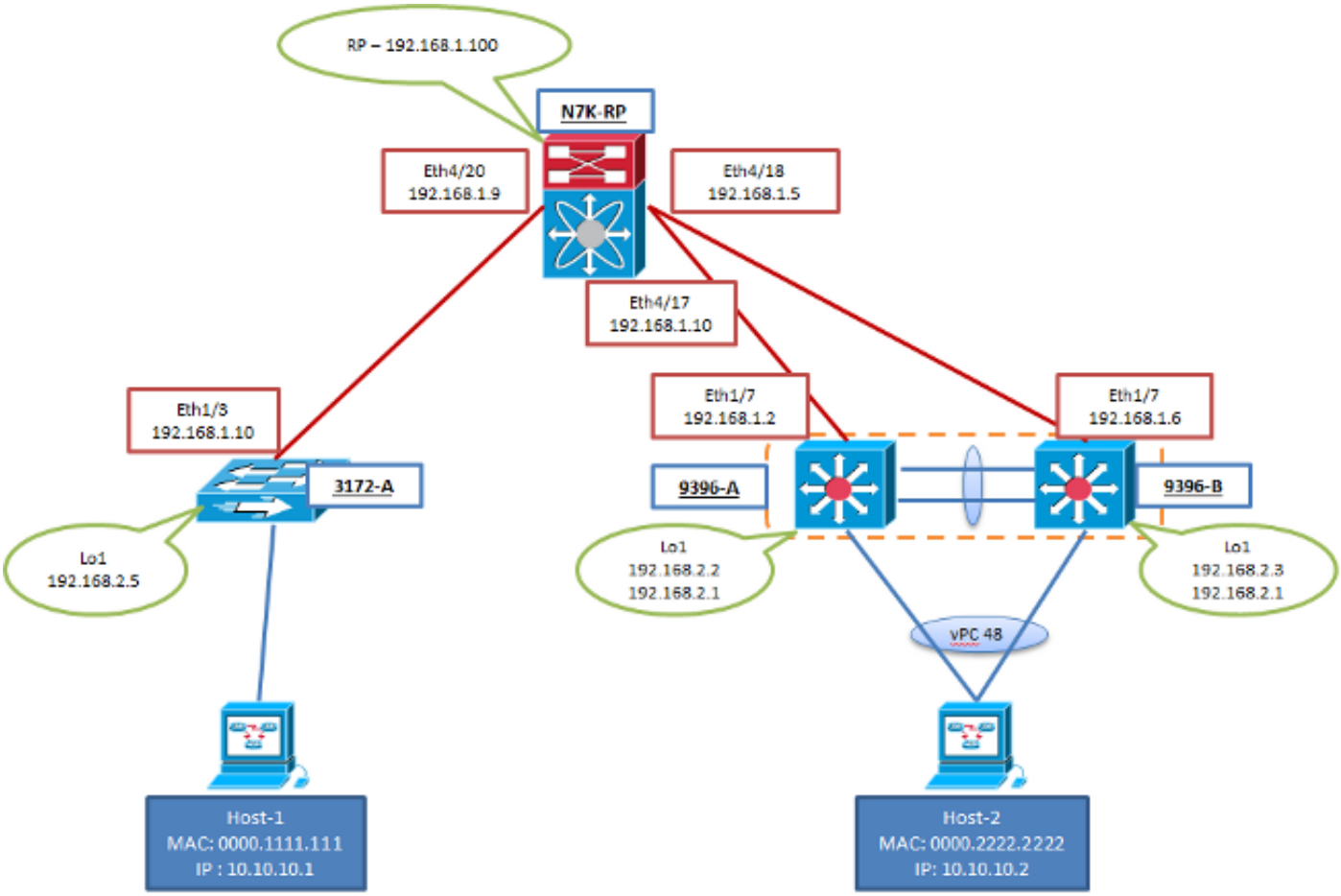
1. 1600 萬個 VNI（廣播網域）相較於傳統 VLAN 提供的 4000 個。
2. 允許在 IP 網路中的任何位置擴充 L2。
3. 最佳化泛濫行為。

為什麼要使用VXLAN

- VLAN 可擴充性 - VXLAN 將第 2 層區段 ID 欄位擴充為 24 位元，這可能允許同一個網路上最多有 1600 萬個不重複的 L2 區段。
- L2 區段對 L3 邊界具有彈性 - VXLAN 將一個 L2 訊框封裝在 IP UDP 標頭中，允許 L2 跨路由器邊界相鄰。
- 利用傳輸網路中的多點傳送，在 L2 區段中模擬廣播、未知的單點傳送和多點傳送的泛濫行為。
- 利用等價多重路徑 (ECMP)，透過過傳輸網路實現最佳路徑使用情況。

設定

網路圖表



組態

這些是 VXLAN 組態的專屬組態。請注意，9396-A和B位於vPC網域中，而3172-A不是。這些組態假設，使用您選擇的路由通訊協定，可充分連線至拓撲中的所有 L3 介面。本範例中使用的是開放最短路徑優先 (OSPF) 。另外還假設已透過這些相同的 L3 介面建立了多點傳送路由。

3172-A

```
feature ospf
feature pim
feature vn-segment-vlan-based
feature nv overlay

vlan 10
 vn-segment 160010
vlan 20
 vn-segment 160020

interface nve1
 source-interface loopback1
 member vni 160010 mcast-group 203.0.113.1
 member vni 160020 mcast-group 203.0.113.1
 no shutdown

interface Ethernet1/3
 no switchport
 ip address 192.168.1.10/30
 ip router ospf 2 area 0.0.0.0
 ip pim sparse-mode
```

```
interface loopback1
 ip address 192.168.2.5/32
 ip router ospf 2 area 0.0.0.0
 ip pim sparse-mode
```

9396-A

註：將vPC作為VTEP使用時，會使用回送介面的次要IP，並在兩個對等點之間共用。這就是這兩個對等點向遠端 NVE 對等點表示自己為單一 VTEP 的方式。

```
feature ospf
feature pim
feature vn-segment-vlan-based
feature nv overlay

ip pim rp-address 192.168.1.100 group-list 224.0.0.0/4

vlan 1,10,20
vlan 10
 vn-segment 160010
vlan 20
 vn-segment 160020

vpc domain 1
 peer-switch
 peer-keepalive destination 10.122.140.99
 peer-gateway

interface port-channel1
 switchport mode trunk
 spanning-tree port type network
 vpc peer-link

interface port-channel48
 switchport mode trunk
 vpc 48

interface nve1
 mtu 9216
 no shutdown
 source-interface loopback1
 member vni 160010 mcast-group 203.0.113.1
 member vni 160020 mcast-group 203.0.113.1
interface Ethernet1/7
 no switchport
 ip address 192.168.1.2/30
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode
 no shutdown

interface loopback1
 ip address 192.168.2.2/32
 ip address 192.168.2.1/32 secondary
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode
```

9396-B

註：將vPC作為VTEP使用時，會使用回送介面的次要IP，並在兩個對等點之間共用。這就是這兩個對等點向遠端 NVE 對等點表示自己為單一 VTEP 的方式。

```
feature ospf
feature pim
feature vn-segment-vlan-based
feature nv overlay

ip pim rp-address 192.168.1.100 group-list 224.0.0.0/4

vlan 1,10,20
vlan 10
 vn-segment 160010
vlan 20
 vn-segment 160020

vpc domain 1
 peer-switch
 peer-keepalive destination 10.122.140.98
 peer-gateway

interface port-channel1
 switchport mode trunk
 spanning-tree port type network
 vpc peer-link

interface port-channel48
 switchport mode trunk
 vpc 48

interface nve1
 mtu 9216
 no shutdown
 source-interface loopback1
 member vni 160010 mcast-group 203.0.113.1
 member vni 160020 mcast-group 203.0.113.1

interface Ethernet1/7
 no switchport
 ip address 192.168.1.6/30
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode
 no shutdown

interface loopback1
 ip address 192.168.2.3/32
 ip address 192.168.2.1/32 secondary
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode
```

驗證

使用本節內容，確認您的組態是否正常運作。

Cisco CLI Analyzer（僅供已註冊客戶使用）支援某些 show 指令。使用 Cisco CLI Analyzer 檢視 **show 指令輸出的分析。**

- **show nve peers <** — 流量從重疊的兩端起始之前，看不到此指令的任何輸出
- **show nve vni**

- show run interface nve1
- show nve internal platform interface detail (僅限 9K)
- show mac address-table
- show ip mroute detail

輸出範例

這些輸出處於穩定狀態。VTEP 對等點已發現彼此，且流量已經以封裝和解除封裝方向通過。

3172-A

```
3172-A# show nve peers
Interface          Peer-IP           Peer-State
----------------   ---------------   -------------
nve1               192.168.2.1        Up

3712-A# show nve vni
Interface          VNI        Multicast-group   VNI State
----------------   --------   ---------------   ---------
nve1               160010     203.0.113.1         Up
nve1               160020     203.0.113.1         Up

3172-A# show run interface nve1

!Command: show running-config interface nve1
!Time: Sat Apr 25 15:09:13 2015

version 6.0(2)U5(1)

interface nve1
 source-interface loopback1
 member vni 160010 mcast-group 203.0.113.1
 member vni 160020 mcast-group 203.0.113.1
 no shutdown

3172-A# show nve internal platform interface detail

3172-A# show mac address-table vlan 10
Legend:
       * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
       age - seconds since first seen,+ - primary entry using vPC Peer-Link
  VLAN     MAC Address      Type      age     Secure NTFY   Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 10       0000.1111.1111    dynamic   5030       F    F  Eth1/48
* 10       0000.2222.2222    dynamic   5010       F    F  nve1(192.168.2.1)

3172-A# show ip mroute detail
IP Multicast Routing Table for VRF "default"

Total number of routes: 3
Total number of (*,G) routes: 1
Total number of (S,G) routes: 1
Total number of (*,G-prefix) routes: 1

(*, 231.1.1.1/32), uptime: 3w3d, static(1) pim(0) ip(0)
 Stats: 15/1539 [Packets/Bytes], 0.000   bps
 Incoming interface: Ethernet1/3, RPF nbr: 192.168.1.9, uptime: 1w0d
 Outgoing interface list: (count: 1)
```

```
   loopback1, uptime: 3w3d, static

(192.168.2.5/32, 231.1.1.1/32), uptime: 3w3d, ip(0) mrib(1) pim(1)
 Stats: 142751/9136064 [Packets/Bytes], 34.133  bps
 Incoming interface: loopback1, RPF nbr: 192.168.2.5, uptime: 3w3d
 Outgoing interface list: (count: 2)
   Ethernet1/3, uptime: 1w0d, pim
   loopback1, uptime: 3w3d, mrib, (RPF)

(*, 232.0.0.0/8), uptime: 3w3d, pim(0) ip(0)
 Stats: 0/0 [Packets/Bytes], 0.000   bps
 Incoming interface: Null, RPF nbr: 0.0.0.0, uptime: 3w3d
 Outgoing interface list: (count: 0)
```

9396-A

```
9396-A# show nve peers
Interface Peer-IP          State LearnType Uptime   Router-Mac
--------- ---------------  ----- --------- -------- -----------------
nve1      192.168.2.5      Up    DP        2d20h    n/a

9396-A# show nve vni
Codes: CP - Control Plane        DP - Data Plane
      UC - Unconfigured         SA - Suppress ARP

Interface VNI      Multicast-group   State Mode Type [BD/VRF]      Flags
--------- -------- ----------------- ----- ---- ------------------ -----
nve1      160010   203.0.113.1         Up    DP   L2 [10]
nve1      160020   203.0.113.1         Up    DP   L2 [20]

9396-A# show run interface nve1

!Command: show running-config interface nve1
!Time: Sat Apr 25 15:20:45 2015

version 7.0(3)I1(1a)

interface nve1
 mtu 9216
 no shutdown
 source-interface loopback1
 member vni 160010 mcast-group 203.0.113.1
 member vni 160020 mcast-group 203.0.113.1

9396-A# show nve internal platform interface detail
Printing details of all NVE Interfaces
|======|=========================|===============|===============|=====|=====|
|Intf  |State                    |PriIP          |SecIP          |Vnis |Peers|
|======|=========================|===============|===============|=====|=====|
|nve1  |UP                       |192.168.2.2    |192.168.2.1    |2    |1    |
|======|=========================|===============|===============|=====|=====|

SW_BD/VNIs of interface nve1:
================================================
|======|======|=========================|======|====|======|
|Sw BD |Vni   |State                    |Intf  |Type|Vrf-ID|
|======|======|=========================|======|====|======|
|10    |160010|UP                       |nve1  |DP  |0
|20    |160020|UP                       |nve1  |DP  |0
|======|======|=========================|======|====|======|
Peers of interface nve1:
================================================
```

```
peer_ip: 192.168.2.5, peer_id: 1, state: UP MAC-learning: Enabled
active_swbds:
add_pending_swbds:
rem_pending_swbds:

9396-A# show mac address-table vlan 10
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
---------+-----------------+--------+---------+------+----+------------------
+   10     0000.1111.1111   dynamic  0         F      F    nve1(192.168.2.5)
*   10     0000.2222.2222   dynamic  0         F      F    Po48
G    -     7c0e.ceca.f177   static   -         F      F    sup-eth1(R)

9396-A# show ip mroute detail
IP Multicast Routing Table for VRF "default"

Total number of routes: 4
Total number of (*,G) routes: 1
Total number of (S,G) routes: 2
Total number of (*,G-prefix) routes: 1

(*, 231.1.1.1/32), uptime: 2d21h, nve(1) ip(0) pim(0)
 Data Created: No
 Stats: 1/64 [Packets/Bytes], 0.000   bps
 Stats: Inactive Flow
 Incoming interface: Ethernet1/7, RPF nbr: 192.168.1.1
 Outgoing interface list: (count: 1)
   nve1, uptime: 2d21h, nve

(192.168.2.1/32, 203.0.113.1/32), uptime: 2d21h, nve(0) ip(0) mrib(0) pim(0)
 Data Created: Yes
 VXLAN Flags
   VXLAN Encap
 Stats: 1/51 [Packets/Bytes], 0.000   bps
 Stats: Inactive Flow
 Incoming interface: loopback1, RPF nbr: 192.168.2.1
 Outgoing interface list: (count: 0)

(192.168.2.5/32, 203.0.113.1/32), uptime: 2d21h, ip(0) mrib(0) nve(1) pim(0)
 Data Created: Yes
 Stats: 16474/1370086 [Packets/Bytes], 13.600  bps
 Stats: Active Flow
 Incoming interface: Ethernet1/7, RPF nbr: 192.168.1.1
 Outgoing interface list: (count: 1)
   nve1, uptime: 2d21h, nve

(*, 232.0.0.0/8), uptime: 2d21h, pim(0) ip(0)
 Data Created: No
 Stats: 0/0 [Packets/Bytes], 0.000   bps
 Stats: Inactive Flow
 Incoming interface: Null, RPF nbr: 0.0.0.0
 Outgoing interface list: (count: 0)

9396-A# show vpc
Legend:
               (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                     : 1
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
```

```
Configuration consistency status  : success
Per-vlan consistency status       : success
Type-2 consistency status         : success
vPC role                          : secondary
Number of vPCs configured         : 1
Peer Gateway                      : Enabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1,10,20

vPC status
----------------------------------------------------------------------------
id   Port   Status Consistency Reason                     Active vlans
--   ----   ------ ----------- ------                     ------------
48   Po48   up     success     success                    1,10
```

9396-B

```
9396-B# show nve peers
Interface Peer-IP          State LearnType Uptime   Router-Mac
--------- ---------------  ----- --------- -------- -----------------
nve1      192.168.2.5      Up    DP        1w0d     n/a

9396-B# show nve vni
Codes: CP - Control Plane        DP - Data Plane
      UC - Unconfigured         SA - Suppress ARP

Interface VNI      Multicast-group   State Mode Type [BD/VRF]      Flags
--------- -------- ----------------- ----- ---- ------------------ -----
nve1      160010   203.0.113.1         Up    DP   L2 [10]
nve1      160020   203.0.113.1         Up    DP   L2 [20]

9396-B# show run interface nve1

!Command: show running-config interface nve1
!Time: Sat Apr 25 15:23:25 2015

version 7.0(3)I1(1b)

interface nve1
 mtu 9216
 no shutdown
 source-interface loopback1
 member vni 160010 mcast-group 203.0.113.1
 member vni 160020 mcast-group 203.0.113.1

9396-B# show nve internal platform interface detail
Printing details of all NVE Interfaces
|======|=========================|===============|===============|=====|=====|
|Intf  |State                    |PriIP          |SecIP          |Vnis |Peers|
|======|=========================|===============|===============|=====|=====|
|nve1  |UP                       |192.168.2.3    |192.168.2.1    |2    |1    |
|======|=========================|===============|===============|=====|=====|

SW_BD/VNIs of interface nve1:
================================================
```

```
|======|======|=========================|======|====|======|
|Sw BD |Vni   |State                    |Intf  |Type|Vrf-ID|
|======|======|=========================|======|====|======|
|10    |160010|UP                       |nve1  |DP  |0
|20    |160020|UP                       |nve1  |DP  |0
|======|======|=========================|======|====|======|
Peers of interface nve1:
==========================================

peer_ip: 192.168.2.5, peer_id: 1, state: UP MAC-learning: Enabled
active_swbds:
add_pending_swbds:
rem_pending_swbds:

9396-B# show mac address-table vlan 10
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
---------+-----------------+--------+---------+------+----+------------------
*   10     0000.1111.1111   dynamic  0         F      F    nve1(192.168.2.5)
+   10     0000.2222.2222   dynamic  0         F      F    Po48
G    -     58f3.9ca3.64dd   static   -         F      F    sup-eth1(R)

9396-B# show ip mroute detail
IP Multicast Routing Table for VRF "default"

Total number of routes: 4
Total number of (*,G) routes: 1
Total number of (S,G) routes: 2
Total number of (*,G-prefix) routes: 1

(*, 231.1.1.1/32), uptime: 2w1d, nve(1) ip(0) pim(0)
 Data Created: No
 VXLAN Flags
   VXLAN Decap
 VPC Flags
   RPF-Source Forwarder
 Stats: 1/64 [Packets/Bytes], 0.000   bps
 Stats: Inactive Flow
 Incoming interface: Ethernet1/7, RPF nbr: 192.168.1.5
 Outgoing interface list: (count: 1)
   nve1, uptime: 2w1d, nve

(192.168.2.1/32, 203.0.113.1/32), uptime: 2w1d, nve(0) ip(0) mrib(0) pim(1)
 Data Created: Yes
 VXLAN Flags
   VXLAN Encap
 VPC Flags
   RPF-Source Forwarder
 Stats: 5/511 [Packets/Bytes], 0.000   bps
 Stats: Inactive Flow
 Incoming interface: loopback1, RPF nbr: 192.168.2.1
 Outgoing interface list: (count: 1)
   Ethernet1/7, uptime: 1w0d, pim

(192.168.2.5/32, 203.0.113.1/32), uptime: 2w1d, ip(0) mrib(0) pim(0) nve(1)
 Data Created: Yes
 VXLAN Flags
   VXLAN Decap
 VPC Flags
   RPF-Source Forwarder
 Stats: 86621/7241564 [Packets/Bytes], 13.600  bps
```

```
 Stats: Active Flow
 Incoming interface: Ethernet1/7, RPF nbr: 192.168.1.5
 Outgoing interface list: (count: 1)
   nve1, uptime: 2w1d, nve

(*, 232.0.0.0/8), uptime: 2w1d, pim(0) ip(0)
 Data Created: No
 Stats: 0/0 [Packets/Bytes], 0.000   bps
 Stats: Inactive Flow
 Incoming interface: Null, RPF nbr: 0.0.0.0
 Outgoing interface list: (count: 0)

9396-B# show vpc
Legend:
               (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                     : 1
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : success
Per-vlan consistency status       : success
Type-2 consistency status         : success
vPC role                          : primary
Number of vPCs configured         : 1
Peer Gateway                      : Enabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1,10,20

vPC status
----------------------------------------------------------------------------
id   Port   Status Consistency Reason                     Active vlans
--   ----   ------ ----------- ------                     ------------
48   Po48   up     success     success                    1,10
```

VXLAN 封包擷取

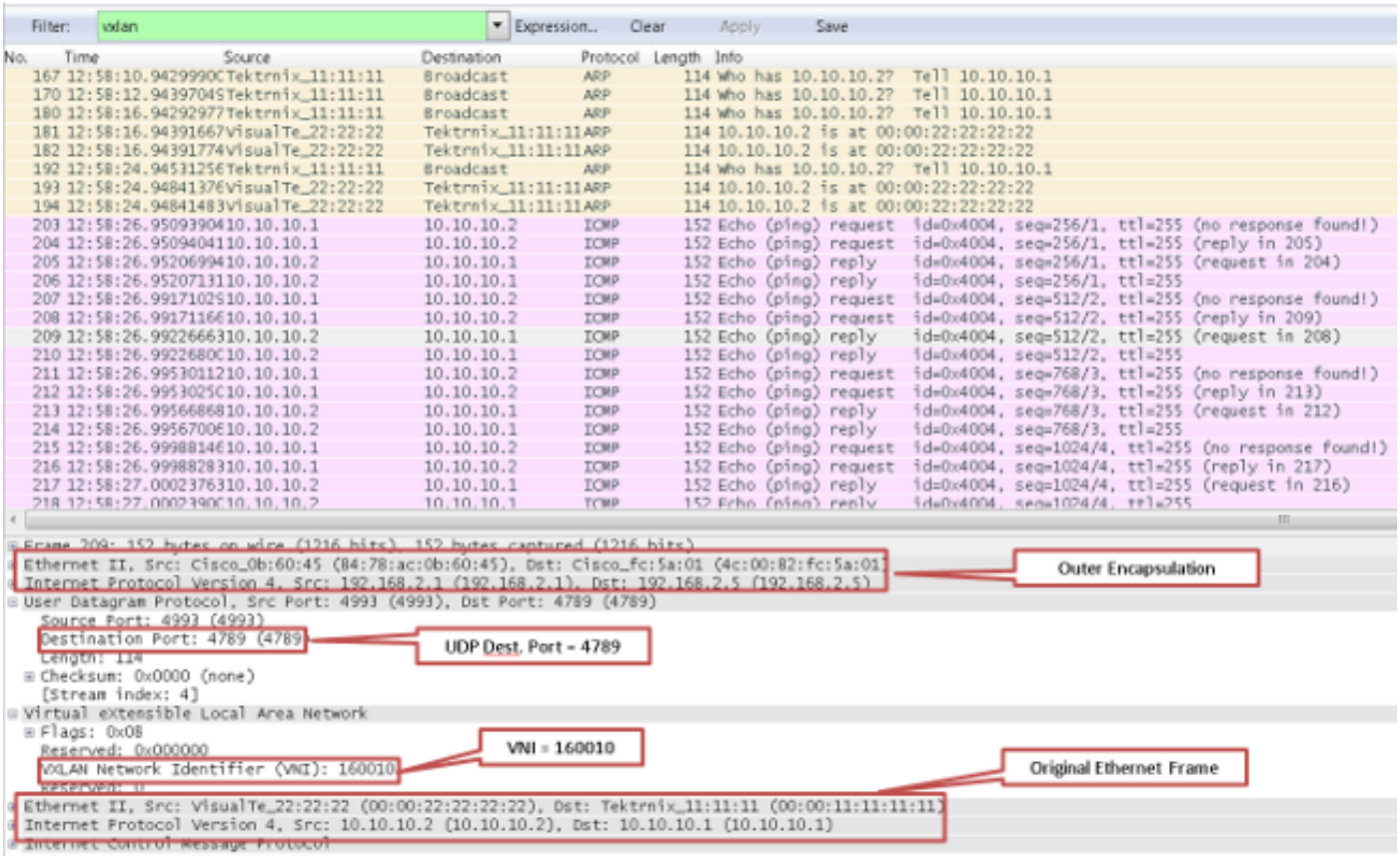
封包擷取 (PCAP) 來自上一個拓撲，其中包含網路圖中所顯示拓撲的 OSPF hello、PIM 加入/註冊和 VXLAN 封裝流量。您可以注意到有一些網際網路控制訊息協定(ICMP)旗標，例如「無回應」。這是因為在 RP 上完成監控作業階段的性質。

監控作業階段包含的介面 Eth4/17-18 和 Eth4/20，因此會拋出一些給 Wireshark。重要的資訊為格式和旗標。

> **註**：所有封裝的封包（BUM或已知單點傳播）均源自於要傳至遠端VTEP回送IP的VTEP回送IP。這是任何 vPC VTEP 上的次要回送 IP。

BUM（廣播、未知單點傳播、多點傳送）流量可以傳至mcast群組。

單點傳播流量將傳至遠端 VTEP 回送 IP。



疑難排解

目前尚無特定資訊可用於排解此組態的疑難問題。

相關資訊

- VXLAN概覽：Cisco Nexus 9000系列交換機
- 技術支援與文件 - Cisco Systems

關於此翻譯

思科已使用電腦和人工技術翻譯本文件，讓全世界的使用者能夠以自己的語言理解支援內容。請注意，即使是最佳機器翻譯，也不如專業譯者翻譯的內容準確。Cisco Systems, Inc. 對這些翻譯的準確度概不負責，並建議一律查看原始英文文件（提供連結）。