

# 使用非vPC L2中繼驗證Nexus 9000系列ARP & MAC表同步行為

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## 簡介

本文檔描述了在共用非vPC第2層中繼的Nexus 9000裝置之間可能出現的ARP和MAC表行為。

## 背景資訊

僅當SVI不使用使用者定義的MAC地址，並且在vPC域下配置了vPC對等網關功能時，才會出現此行為。此外，只有當ARP表保持填充狀態，而MAC地址表沒有指定主機的MAC條目時，才會出現這種情況。

本文所述行為是第一代Nexus交換機的ASIC限制，並不影響Nexus 9300 Cloud Scale(EX/FX/GX/C)交換機及更高版本，並且已記錄為思科錯誤ID [CSCuh9486](#)的一部分。

## 需求

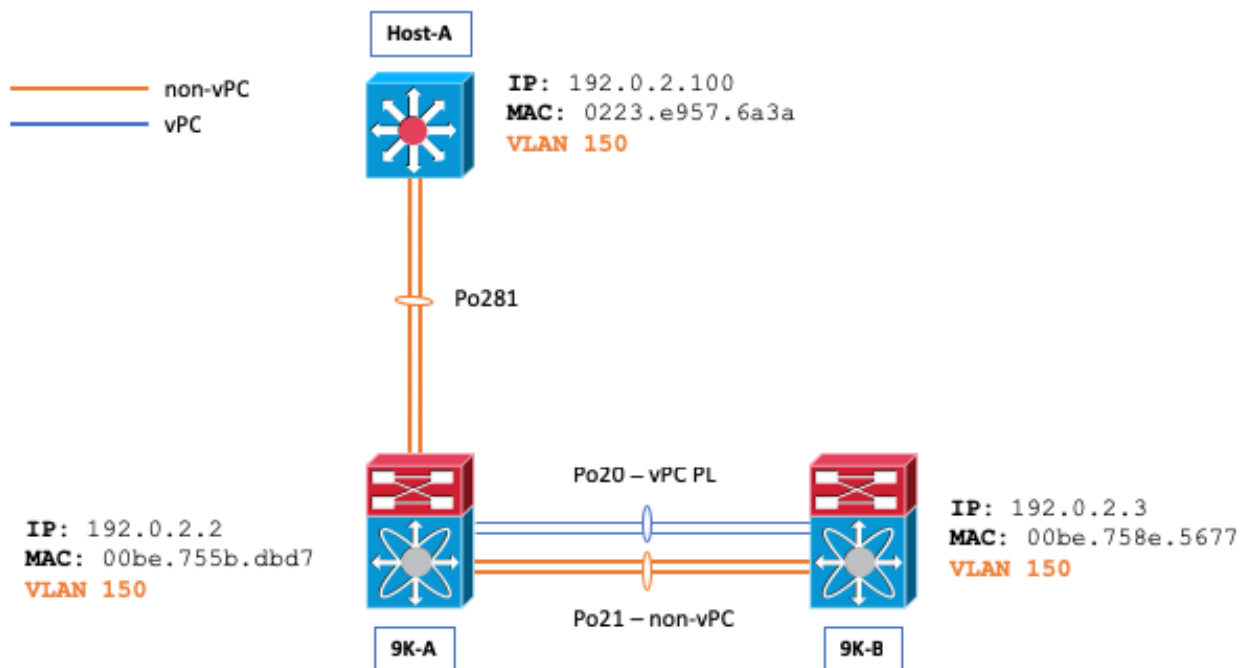
虛擬連線埠通道(vPC)、NXOS虛擬連線埠通道對等閘道功能和Nexus作業系統(NXOS)的一般知識。

## 採用元件

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。

- Nexus 3000s/Nexus 9000s ( 僅限第一代 )
- 虛擬連線埠通道功能(vPC)
- vPC對等網關功能
- 非vPC第2層(L2)中繼
- 非vPC SVI
- NX-OS 7.0(3)I7(5)

## 拓撲



## 概觀

考慮以下情況：主機A和9K-B之間的ARP和MAC地址表為空，並且從主機A向9K-B發起了ping。

```
Host-A# ping 192.0.2.3
PING 192.0.2.3 (192.0.2.3): 56 data bytes
36 bytes from 192.0.2.100: Destination Host Unreachable
Request 0 timed out
64 bytes from 192.0.2.3: icmp_seq=1 ttl=254 time=1.011 ms
64 bytes from 192.0.2.3: icmp_seq=2 ttl=254 time=0.763 ms
64 bytes from 192.0.2.3: icmp_seq=3 ttl=254 time=0.698 ms
64 bytes from 192.0.2.3: icmp_seq=4 ttl=254 time=0.711 ms

--- 192.0.2.3 ping statistics ---
5 packets transmitted, 4 packets received, 20.00% packet loss
round-trip min/avg/max = 0.698/0.795/1.011 ms
```

從主機A發出的ping會導致主機A傳送對9K-B的ARP請求。ARP請求從9K-A上的Po21（在VLAN上泛洪）中發出，同時從Po20（通過思科交換矩陣服務[CFS]進行隧道傳輸）中發出。結果，9K-B上的MAC地址表被正確填充，並且ARP條目被插入9K-B的ARP表中，該表指向主機A的MAC地址0223.e957.6a3a的Po21（非vPC L2中繼）。

```
N9K-B# show ip arp 192.0.2.100
```

```
Flags: * - Adjacencies learnt on non-active FHRP router
+ - Adjacencies synced via CFSOE
# - Adjacencies Throttled for Glean
CP - Added via L2RIB, Control plane Adjacencies
PS - Added via L2RIB, Peer Sync
RO - Re-Originated Peer Sync Entry
D - Static Adjacencies attached to down interface
```

```
IP ARP Table
Total number of entries: 1
```

```
Address      Age      MAC Address  Interface  Flags
192.0.2.100  00:01:07  0223.e957.6a3a  Vlan150
```

```
N9K-B# show mac address-table address | i i 6a3a
* 150      0223.e957.6a3a  dynamic 0      F      F      Po21
```

```
N9K-B# show ip arp detail | i 3a
192.0.2.100  00:03:22  0223.e957.6a3a  Vlan150      port-channel21  <<<< Expected port-
channel
```

當從N9K-B的MAC地址表中刪除主機A的MAC地址時，可以看到此問題。MAC地址可能由於各種原因被刪除，例如MAC地址老化、生成樹協定(STP)拓撲更改通知(TCN)、通過命令列介面運行clear mac address-table dynamic命令等。

```
N9K-B# show ip arp 192.0.2.100
```

```
Flags: * - Adjacencies learnt on non-active FHRP router
+ - Adjacencies synced via CFSOE
# - Adjacencies Throttled for Glean
CP - Added via L2RIB, Control plane Adjacencies
PS - Added via L2RIB, Peer Sync
RO - Re-Originated Peer Sync Entry
D - Static Adjacencies attached to down interface
```

```
IP ARP Table
```

```
Total number of entries: 1
```

```
Address      Age      MAC Address  Interface  Flags
192.0.2.100  00:00:29  0223.e957.6a3a  Vlan150      <<< ARP remains populated
```

```
N9K-B# show mac address-table address 0223.e957.6a3a
```

```
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, C - ControlPlane MAC, ~ - vsan
```

```
VLAN      MAC Address      Type      age      Secure NTFY Ports
```

```
-----+-----+-----+-----+-----+-----+-----
```

```
N9K-B# ping 192.0.2.100
```

```
PING 192.0.2.100 (192.0.2.100): 56 data bytes
```

```
64 bytes from 192.0.2.100: icmp_seq=0 ttl=253 time=1.112 ms
```

```
64 bytes from 192.0.2.100: icmp_seq=1 ttl=253 time=0.647 ms
```

```
64 bytes from 192.0.2.100: icmp_seq=2 ttl=253 time=0.659 ms
```

```
64 bytes from 192.0.2.100: icmp_seq=3 ttl=253 time=0.634 ms
```

```
64 bytes from 192.0.2.100: icmp_seq=4 ttl=253 time=0.644 ms
```

```
--- 192.0.2.100 ping statistics ---
```

```
5 packets transmitted, 5 packets received, 0.00% packet loss
```

```
round-trip min/avg/max = 0.634/0.739/1.112 ms
```

請注意ping仍然成功；但是，我們的ARP條目現在指向Po20(vPC PL)而不是Po21，後者不是預期的埠通道，因為VLAN 150是非VPC VLAN:

```
N9K-B# show ip arp detail | i i 6a3a
```

```
Flags: * - Adjacencies learnt on non-active FHRP router
+ - Adjacencies synced via CFSOE
# - Adjacencies Throttled for Glean
```

CP - Added via L2RIB, Control plane Adjacencies  
PS - Added via L2RIB, Peer Sync  
RO - Re-Originated Peer Sync Entry

IP ARP Table for context default

Total number of entries: 2

Address	Age	MAC Address	Interface	Physical Interface	Flags
192.0.2.100	00:15:54	0223.e957.6a3a	Vlan150	port-channel20	<<< Not Po21 once the issue is triggered.

您可以在兩台Nexus 9000交換器上使用**show ip arp internal event-history event**命令來演示封包是否透過思科光纖服務(CFS)進行通道化：

```
N9K-B# show ip arp internal event-history event | i i tunnel
[116] [27772]: Tunnel Packets came with: vlan: 150, L2-SMAC :0223.e957.6a3a, L2-DMAC:
00be.758e.5677
```

```
[116] [27772]: Received tunneled packet on iod: Vlan150, physical iod: port-channel20
```

```
N9K-A# show ip arp internal event-history event | i i tunnel
[116] [28142]: Tunnel Packets sent with: vlan: 150, L2-SMAC :0223.e957.6a3a, L2-DMAC:
00be.758e.5677
```

```
[116] [28142]: Tunnel it to peer destined to remote SVI's Gateway MAC. Peer Gateway Enabled
```

您還可以在9K-B上使用**debug ip arp**系列調試命令來詳細描述此行為：

```
N9K-B# debug logfile TAC_ARP
```

```
N9K-B# debug ip arp packet
```

```
N9K-B# debug ip arp event
```

```
N9K-B# debug ip arp error
```

```
N9K-B# show debug logfile TAC_ARP | beg "15:31:23"
```

```
2018 Oct 11 15:31:23.954433 arp: arp_send_request_internal: Our own address 192.0.2.3 on
interface Vlan150,sender_pid =27661
```

```
2018 Oct 11 15:31:23.955221 arp: arp_process_receive_packet_msg: Received tunneled packet on
iod: Vlan150, physical iod: port-channel20
```

```
2018 Oct 11 15:31:23.955253 arp: arp_process_receive_packet_msg: Tunnel Packets came with: vlan:
150, L2-SMAC :0223.e957.6a3a, L2-DMAC: 00be.758e.5677
```

```
2018 Oct 11 15:31:23.955275 arp: (context 1) Receiving packet from Vlan150, logical interface
Vlan150 physical interface port-channel20, (prty 6) Hrd type 1 Prot type 800 Hrd len 6 Prot len
4 OP 2, Pkt size 46
```

```
2018 Oct 11 15:31:23.955293 arp: Src 0223.e957.6a3a/192.0.2.100 Dst 00be.758e.5677/192.0.2.3
```

```
2018 Oct 11 15:31:23.955443 arp: arp_add_adj: arp_add_adj: Updating MAC on interface Vlan150,
phy-interface port-channel20, flags:0x1
```

```
2018 Oct 11 15:31:23.955478 arp: arp_adj_update_state_get_action_on_add: Different
MAC(0223.e957.6a3a) Successful action on add Previous State:0x10, Current State:0x10 Received
event:Data Plane Add, entry: 192.0.2.100, 0000.0000.0000, Vlan150, action to be taken
send_to_am:TRUE, arp_aging:TRUE
```

```
2018 Oct 11 15:31:23.955576 arp: arp_add_adj: Entry added for 192.0.2.100, 0223.e957.6a3a, state
2 on interface Vlan150, physical interface port-channel20, ismct 0. flags:0x10, Rearp (interval:
0, count: 0), TTL: 1500 seconds update_shm:TRUE
```

```
2018 Oct 11 15:31:23.955601 arp: arp_add_adj: Adj info: iod: 77, phy-iod: 91, ip: 192.0.2.100,
mac: 0223.e957.6a3a, type: 0, sync: FALSE, suppress-mode: ARP Suppression Disabled flags:0x10
```

ARP應答從主機A進入9K-A，然後隧道連線到9K-B。請注意，9K-A將ARP回覆推送到控制平面，因為對等網關vPC域增強已啟用。這會導致9K-A代表N9K-B路由資料包，即使這是非vPC VLAN。

```
N9K-A# ethanalyzer local interface inband display-filter arp limit-c 0
```

```
Capturing on inband
```

```
2018-10-11 15:32:47.378648 00:be:75:8e:56:77 -> ff:ff:ff:ff:ff:ff ARP Who has 192.0.2.100? Tell
192.0.2.3 <<<<
```

```
2018-10-11 15:32:47.379262 02:23:e9:57:6a:3a -> 00:be:75:8e:56:77 ARP 192.0.2.100 is at
02:23:e9:57:6a:3a
```

您可以使用NX-OS的Ethanalyzer控制平面資料包捕獲功能來顯示9K-B的控制平面從本地看不到此ARP應答。

```
N9K-B# ethanalyzer local interface inband display-filter arp limit-c 0
```

```
Capturing on inband
```

```
2018-10-11 15:33:30.053239 00:be:75:8e:56:77 -> ff:ff:ff:ff:ff:ff ARP Who has 192.0.2.100? Tell
192.0.2.3
2018-10-11 15:34:16.817309 00:be:75:8e:56:77 -> ff:ff:ff:ff:ff:ff ARP Who has 192.0.2.100? Tell
192.0.2.3
2018-10-11 15:34:42.222965 00:be:75:8e:56:77 -> ff:ff:ff:ff:ff:ff ARP Who has 192.0.2.44? Tell
192.0.2.43
<snip>
```

**注意：**根據事件順序和環境的不同，您可能會遇到從N9K-B到主機A的資料包丟失

```
N9K-B# ping 192.0.2.100
```

```
PING 192.0.2.100 (192.0.2.100): 56 data bytes
36 bytes from 192.0.2.3: Destination Host Unreachable
Request 0 timed out
Request 1 timed out
Request 2 timed out
Request 3 timed out
Request 4 timed out
```

```
--- 192.0.2.100 ping statistics ---
```

```
5 packets transmitted, 0 packets received, 100.00% packet loss
```

當未在非vPC SVI上配置SVI使用者定義的MAC地址時（即使這些地址不用於通過vPC路由鄰接關係），也會發生此行為。此行為僅適用於第一代Nexus 9000交換機。

要解決此行為，請更改受影響的SVI的MAC地址。

```
N9K-A(config)# interface Vlan150
```

```
N9K-A(config-if)# mac-address 0000.aaaa.0030
```

```
N9K-A(config-if)# end
```

```
N9K-B(config)# interface Vlan150
```

```
N9K-B(config-if)# mac-address 0000.bbbb.0030
```

```
N9K-B(config-if)# end
```

**注意：**由於硬體限制，一次只能為每個裝置配置16個使用者定義的MAC地址。這記錄在[Cisco Nexus 9000系列NX-OS介面配置指南](#)中。

在應用該解決方法後，您可以使用NX-OS的Ethanalyzer控制平面資料包捕獲功能來顯示9K-A如何從不將ARP回覆推送到其控制平面。

```
N9K-A# ethanalyzer local interface inband display-filter arp limit-c 0
```

```
Capturing on inband
```

```
2018-10-11 15:36:11.675108 00:00:bb:bb:00:30 -> ff:ff:ff:ff:ff:ff ARP Who has 192.0.2.100? Tell
```

## 相關資訊

有關第2層非vPC中繼、路由鄰接關係和SVI使用者定義MAC要求的詳細資訊，請參閱[建立虛擬埠通道路由拓撲](#)文檔。

## 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）。