在Catalyst 9000系列交换机上实施BGP EVPN DHCP第2层中继

目录

简介

本文档介绍如何配置、验证EVPN VxLAN DHCP L2中继功能并对其进行故障排除。

先决条件

要求

- 此功能用于任何使用DHCP的CGW类型部署
- 如果实施受保护分段，请查阅这些文档
  - 在Catalyst 9000系列交换机上实施BGP EVPN路由策略
  - 在Catalyst 9000系列交换机上实施BGP EVPN保护的重叠分段

使用的组件

本文档中的信息基于以下软件和硬件版本：

- Catalyst 9300
- Catalyst 9400
- Catalyst 9500
- Catalyst 9600
- Cisco IOS® XE 17.12.1及更高版本

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

文档详细信息

本文档可用于任何CGW部署，其中DHCP需要从没有SVI的枝叶中继到中央网关。

- 如果未使用受保护的分段，请使用文档中将SVI通告到交换矩阵的部分

如果要实施受保护分段，本文档是3个相互关联的文档的第2部分：

- 文档1：在Catalyst 9000系列交换机上实施BGP EVPN路由策略介绍了如何控制重叠中的BGP BUM流量，必须首先进行配置
- 文档2：在Catalyst 9000系列交换机上实施BGP EVPN保护的重叠分段在文档1的重叠设计和策略的基础上构建，描述“protected”关键字的实施。
- 文档3：本文档。在前两个文档之上构建，描述仅使用第2层枝叶和CGW实施DHCP中继的方式

L2中继行为

中继	监听	核心泛洪	访问泛洪	IPv4
是	是	否	是	• 选项82子选项：(1)代理电路ID (vni-mod-port)使用dhcp监听填充 • 您可以使用dhcp trust配置限制接入端 *推荐的型号
是	否	是	是	• 选项82子选项：(1)代理电路ID (vlan-mod-port)使用dhcp监听填充
否	是	否	是	• 选项82子选项：(1)代理电路ID (vni-mod-port)使用dhcp监听填充 • 您可以使用dhcp trust配置限制接入端
中继	监听	核心泛洪	访问泛洪	IPv6
是	是	是	是	• 选项82子选项：(1)代理电路ID (vni-mod-port)使用dhcp监听填充 • 您可以使用dhcp trust配置限制接入端
是	否	是	是	• 选项82子选项：(1)代理电路ID (vlan-mod-port)使用dhcp监听填充
否	是	是	是	• 选项82子选项：(1)代理电路ID (vni-mod-port)使用dhcp监听填充 • 您可以使用dhcp trust配置限制接入端
否	否	是	是	

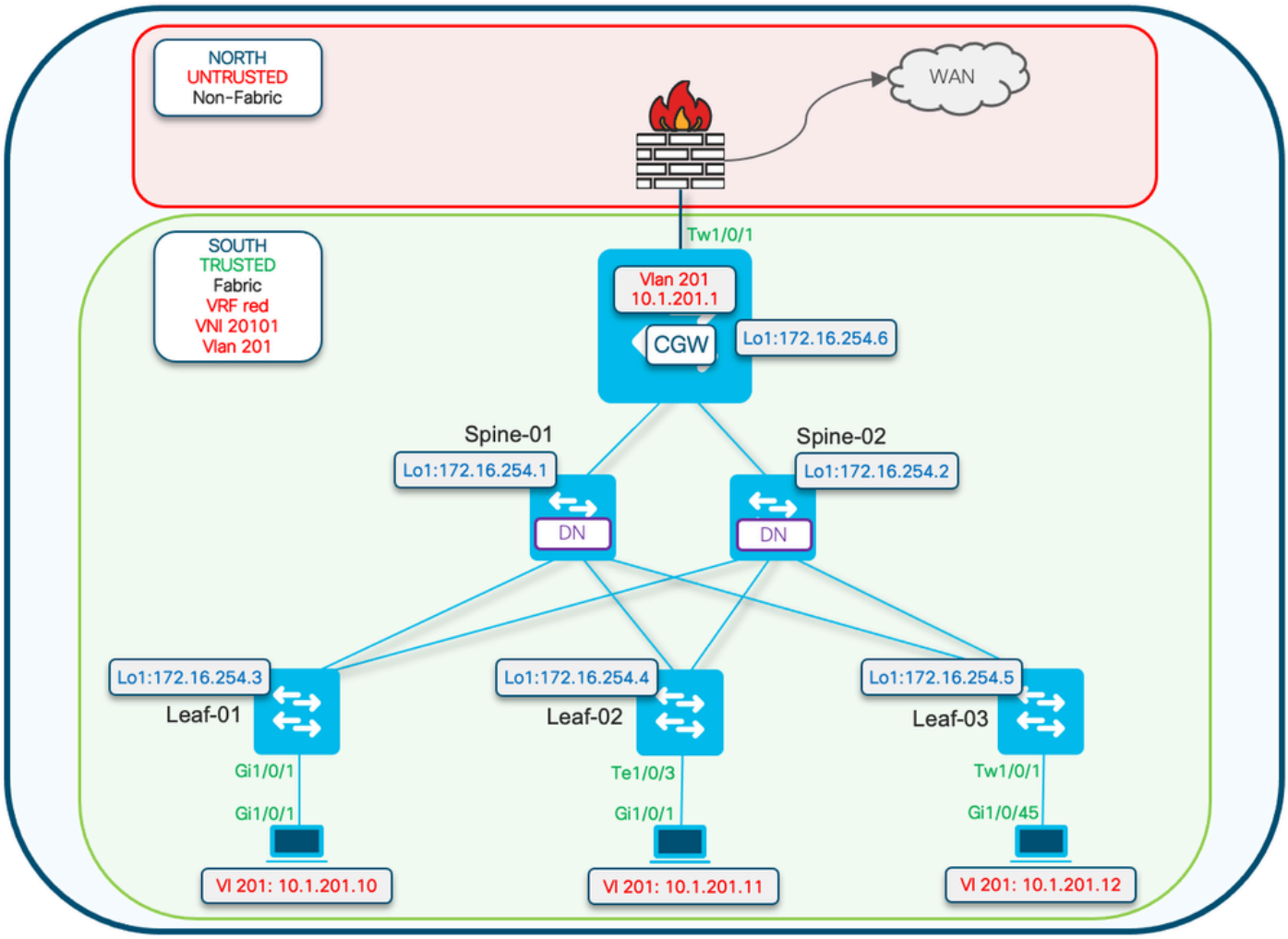
术语

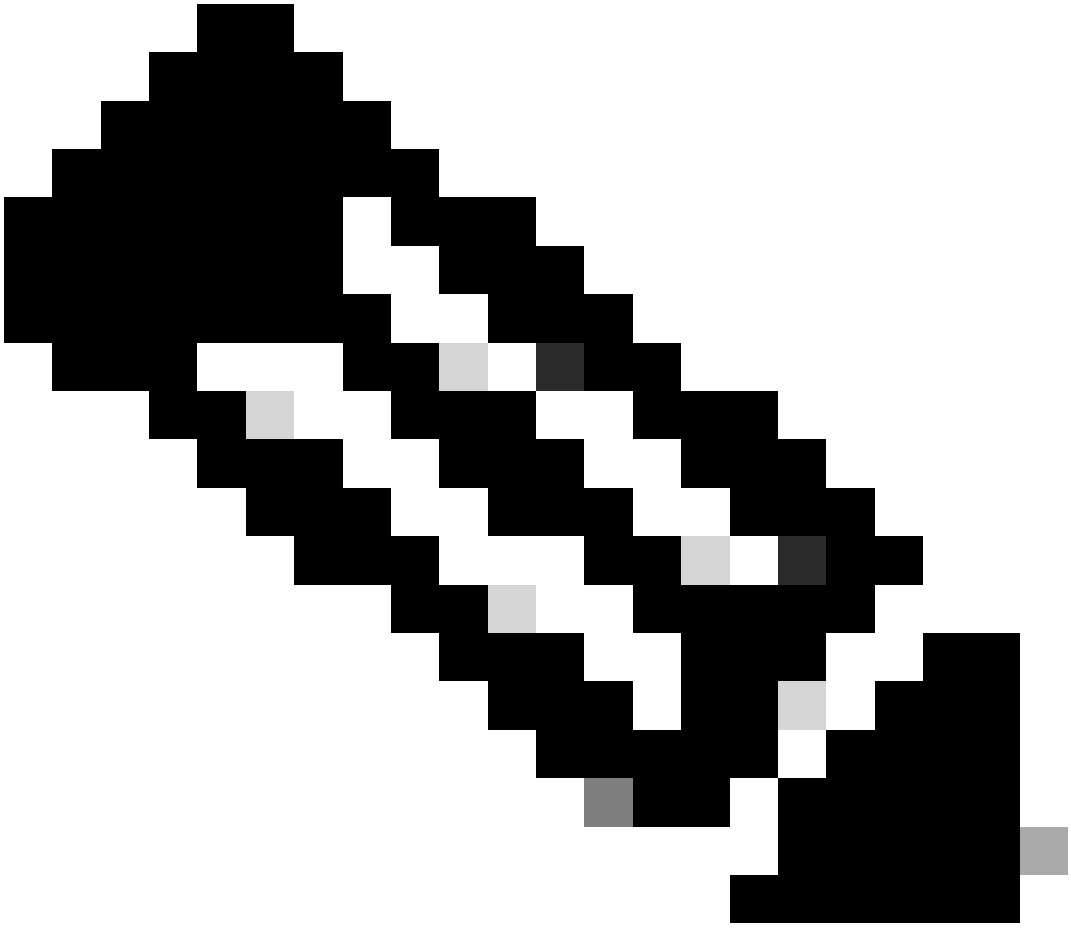
VRF	虚拟路由转发	定义与其他VRF和全局IPv4/IPv6路由域分离的第3层路由域
AF	地址系列	定义BGP处理的前缀类型和路由信息

AS	自治系统	一组属于一个网络或一组网络的可路由IP前缀，全部由单个实体或组织管理、控制和监督
EVPN	以太网虚拟专用网络	允许BGP传输第2层MAC和第3层IP信息的扩展是EVPN，并使用多协议边界网关协议(MP-BGP)作为协议来分发有关VXLAN重叠网络的可达性信息。
VXLAN	虚拟可扩展LAN（局域网）	VXLAN旨在克服VLAN和STP的固有局限性。推荐的IETF标准[RFC 7348]与VLAN提供相同的以太网第2层网络服务，但灵活性更高。从功能上讲，它是MAC-in-UDP封装协议，在第3层底层网络上作为虚拟重叠运行。
CGW	集中式网关	以及网关SVI不在每个枝叶上的EVPN的实施。相反，所有路由都由使用非对称IRB（集成路由和桥接）的特定枝叶完成
DEF网关	默认网关	通过“l2vpn evpn”配置部分下的“default-gateway advertise enable”命令添加到MAC/IP前缀的BGP扩展社区属性。
IMET (RT3)	包括组播以太网标记（路由）	也称为BGP类型3路由。此路由类型在EVPN中用于在VTEP之间传输BUM（广播/未知单播/组播）流量。
RT2	路由类型2	BGP MAC或MAC/IP前缀，表示主机MAC或网关MAC-IP
EVPN经理	EVPN管理器	用于各种其他组件的中央管理组件（例如：从SISF获知并向L2RIB发送信号）
SISF	交换机集成安全功能	EVPN使用的不可知主机跟踪表，用于了解枝叶上的本地主机
L2RIB	第2层路由信息库	在用于管理BGP、EVPN管理器、L2FIB之间交互的中间组件中
FED	转发引擎驱动程序	对ASIC（硬件）层进行编程
MATM	Mac地址表管理器	IOS MATM：仅安装本地地址和 FED MATM：硬件表，安装从控制平面获知的本地和远程地址，是硬件转发平面的一部分

配置（标准CGW部署）

网络图





注意：本部分介绍不使用受保护功能的标准CGW部署。

- 显示DHCP DORA数据包交换的调试仅在受保护网段示例中显示

L2 VTEP（枝叶）密钥详细信息

请求数据包来自客户端

- 使用Default gw advertised CGW mac。
- 如果存在多个gw，则使用第一个gw mac。
- 将外部广播MAC（客户端发起：DORA中的D和R）转换为单播GW MAC并转发到CGW

DHCP监听添加：选项82子选项：电路和RID

（RID由CGW上的响应数据包处理使用）。

(通知CGW其非本地和交换矩阵中继返回L2VTEP)

<#root>

```
Option: (82) Agent Information Option
        Length: 24
        Option 82 Suboption: (1) Agent Circuit ID
            Length: 12
            Agent Circuit ID: 010a000800000277501010000

        Option 82 Suboption: (2) Agent Remote ID

            Length: 8
          Agent Remote ID:
          000

682c7bf88700 <-- switch base mac 682c.7bf8.8700 (from 'show switch')
```

- 通过vxlan隧道从CGW接收的响应数据包。
- Leaf Strips选项82。
- 添加带有客户端源接口的绑定条目。（vxlan-mod-port提供客户端源接口）。
- 转发到客户端的响应数据包。

L3 VTEP (CGW)密钥详细信息

- 启用DHCP监听
- 在SVI中启用DHCP中继
- 从L2VTEP接收请求，并将其提供给中继。
- 中继添加其他选项82子选项（gi、服务器覆盖等）并发送到DHCP服务器。
- 来自dhcp服务器的DHCP响应首先进入RELAY组件。
- 在RELAY删除选项82参数（gi地址、服务器覆盖等）后，数据包将传递到dhcp监听组件。
- 监听组件检查RID（路由器ID），如果它不是本地路由器，则不会删除选项82子选项1和2。
- 交换矩阵中继（因为RID不是本地的）数据包直接转发到远程客户端。
- 使用客户端Mac并执行网桥插入。 硬件执行客户端mac查找，并将具有vxlan封装的数据包转发到始发L2VTEP。

L2VTEP

配置evpn实例

<#root>

```
Leaf-01#
```

show run | beg l2vpn evpn instance 201

```
l2vpn evpn instance 201 vlan-based
 encapsulation vxlan
 replication-type ingress
```

启用DHCP监听

<#root>

```
Leaf-01#
```

show run | sec dhcp snoop

```
ip dhcp snooping vlan 101,
```

201

```
ip dhcp snooping
```

CGW

配置evpn实例

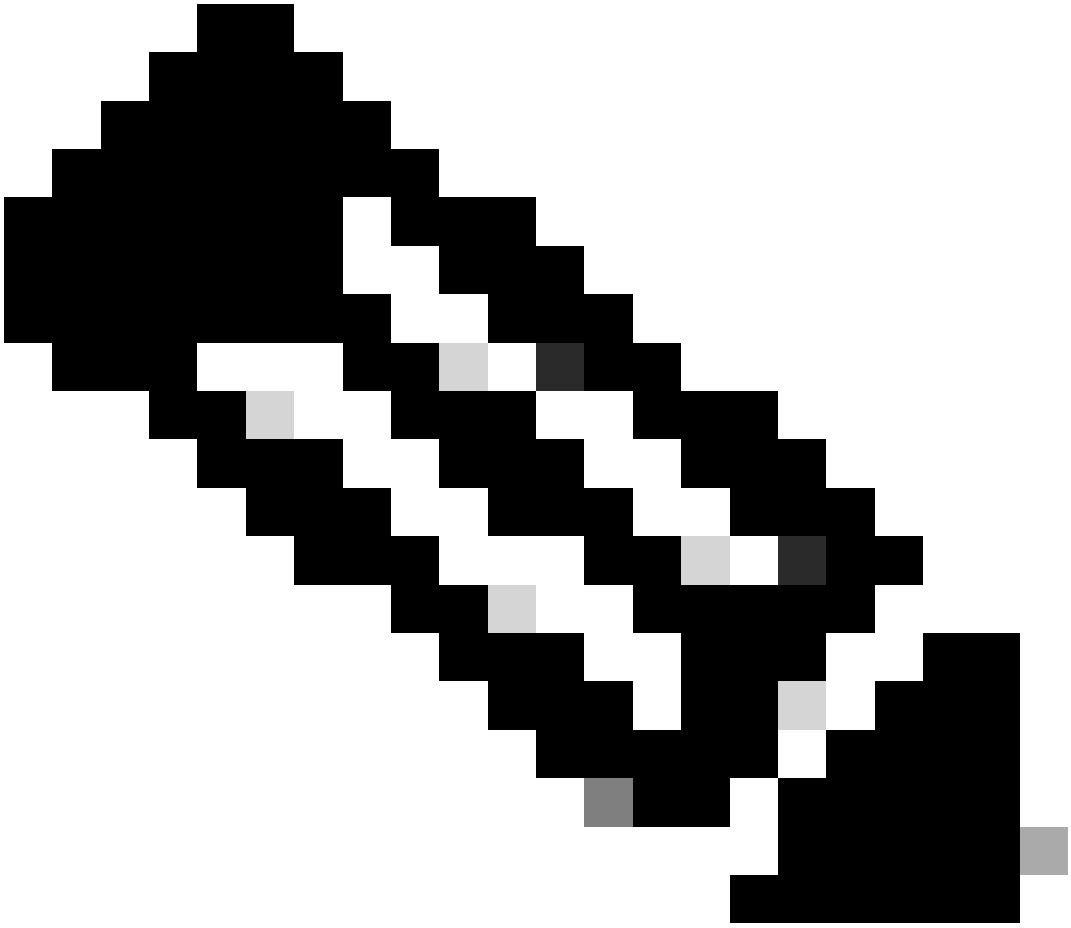
<#root>

```
Border#
```

sh run | s l2vpn evpn instance 201

```
l2vpn evpn instance 201 vlan-based
 encapsulation vxlan
 replication-type ingress
```

default-gateway advertise enable <-- Enable to add BGP DEF GW ext. community attribute



注意：DEF GW属性对于L2中继了解要将DHCP数据包封装和发送到谁至关重要。

启用DHCP监听

<#root>

```
Border#
sh run | s dhcp snoop

ip dhcp snooping vlan 101,
201

ip dhcp snooping
```

确保DHCP中继的配置正确以处理其他选项

<#root>

Border#

sh run int vl 201

Building configuration...

interface Vlan201
 mac-address 0000.beef.cafe
 vrf forwarding red

 ip dhcp relay information option vpn-id <-- Ensure the vrf info is passed to the server

ip dhcp relay source-interface Loopback0 <-- Sets the relay source interface to the loopback

 ip address 10.1.201.1 255.255.255.0

ip helper-address global 10.1.33.33   <-- In this scenario the DHCP server is in the global routing t

验证（标准CGW部署）

网关前缀（枝叶）

<#root>

Leaf-01#

sh bgp l2vpn evpn route-type 2 0 0000.beef.cafe 10.1.201.1

BGP routing table entry for [2][172.16.255.3:201][0][48][0000BEEFCAFE][32][10.1.201.1]/24, version 8964
Paths: (1 available, best #1,

table evi_201

)

<-- In the EVI context for the segment

Not advertised to any peer
Refresh Epoch 3
Local, imported path from [2][172.16.255.6:201][0][48][0000BEEFCAFE][32][10.1.201.1]/24 (global)
  172.16.255.6 (metric 30) (via default) from 172.16.255.1 (172.16.255.1)
    Origin incomplete, metric 0, localpref 100, valid, internal, best
    EVPN ESI: 00000000000000000000,

Label1 20101   <-- Correct segment ID

    Extended Community: RT:65001:201 ENCAP:8

EVPN DEF GW:0:0 <-- GW attribute added indicating this is GW prefix which L2 Relay uses

Originator: 172.16.255.6

, Cluster list: 172.16.255.1

<-- Learned from the Border (CGW)

    rx pathid: 0, tx pathid: 0x0
    Updated on Nov 14 2023 16:06:40 UTC

FED MATM (枝叶)

<#root>

Leaf-01#

show platform software fed switch active matm macTable vlan 201

VLAN MAC Type Seq# EC_Bi Flags machandle siHandle riHandl

---

201 0006.f601.cd42 0x1 32436 0 0 0x71e058dc3368 0x71e058655018 0x0

201 0006.f601.cd01 0x1 32437 0 0 0x71e058dae308 0x71e058655018 0x0

201 0000.beef.cafe 0x5000001

0 0 64 0x71e059177138 0x71e058eeb418 0x71e058df81f8 0x0

VTEP 172.16.255.6 adj_id 1371

No

<--- The GW MAC shows learnt via the Border Leaf Loopback with the right flags

Total Mac number of addresses:: 3
Summary:
Total number of secure addresses:: 0
Total number of drop addresses:: 0
Total number of lisp local addresses:: 0

Total number of lisp remote addresses:: 1 <---

*a_time=aging_time(secs) *e_time=total_elapsed_time(secs)
Type:

MAT_DYNAMIC_ADDR 0x1

MAT_STATIC_ADDR 0x2 MAT_CPU_ADDR 0x4 MAT_DISCARD_ADDR 0x8
MAT_ALL_VLANS 0x10 MAT_NO_FORWARD 0x20 MAT_IPMULT_ADDR 0x40 MAT_RES

```
MAT_DO_NOT_AGE           0x100  MAT_SECURE_ADDR          0x200  MAT_NO_PORT              0x400  MAT_DRO
MAT_DUP_ADDR            0x1000  MAT_NULL_DESTINATION    0x2000  MAT_DOT1X_ADDR          0x4000  MAT_ROU
MAT_WIRELESS_ADDR      0x10000  MAT_SECURE_CFG_ADDR    0x20000  MAT_OPQ_DATA_PRESENT   0x40000  MAT_WIR
MAT_DLR_ADDR          0x100000  MAT_MRP_ADDR          0x200000  MAT_MSRP_ADDR         0x400000  MAT_LIS

MAT_LISP_REMOTE_ADDR 0x1000000

  MAT_VPLS_ADDR        0x2000000

MAT_LISP_GW_ADDR     0x4000000                                  <-- these 3 values added = 0x5000001 (not
```

本地MAC（枝叶）

<#root>

```
Leaf-01#

show switch


Switch/Stack Mac Address : 682c.7bf8.8700 - Local Mac Address
Mac persistency wait time: Indefinite
                                             H/W   Current
Switch#   Role    Mac Address     Priority Version  State
------------------------------------------------------------------------------------
*1       Active

682c.7bf8.8700

     1      V01     Ready

<--- Use to validate the Agent ID in DHCP Option 82
```

DHCP监听（枝叶和CGW）

<#root>

```
Leaf-01#

show ip dhcp snooping


Switch DHCP snooping is enabled


Switch DHCP gleaning is disabled
DHCP snooping is configured on following VLANs:
101,201

DHCP snooping is operational on following VLANs:


101,201
```

```
Insertion of option 82 is enabled
circuit-id default format: vlan-mod-port
remote-id: 682c.7bf8.8700 (MAC)          <--- Leaf-01 adds the switch MAC to Option 82 to indicate to CG
```

```
CGW#
```

```
show ip dhcp snooping
```

```
Switch DHCP snooping is enabled
```

```
Switch DHCP gleaning is disabled
DHCP snooping is configured on following VLANs:
101,201
```

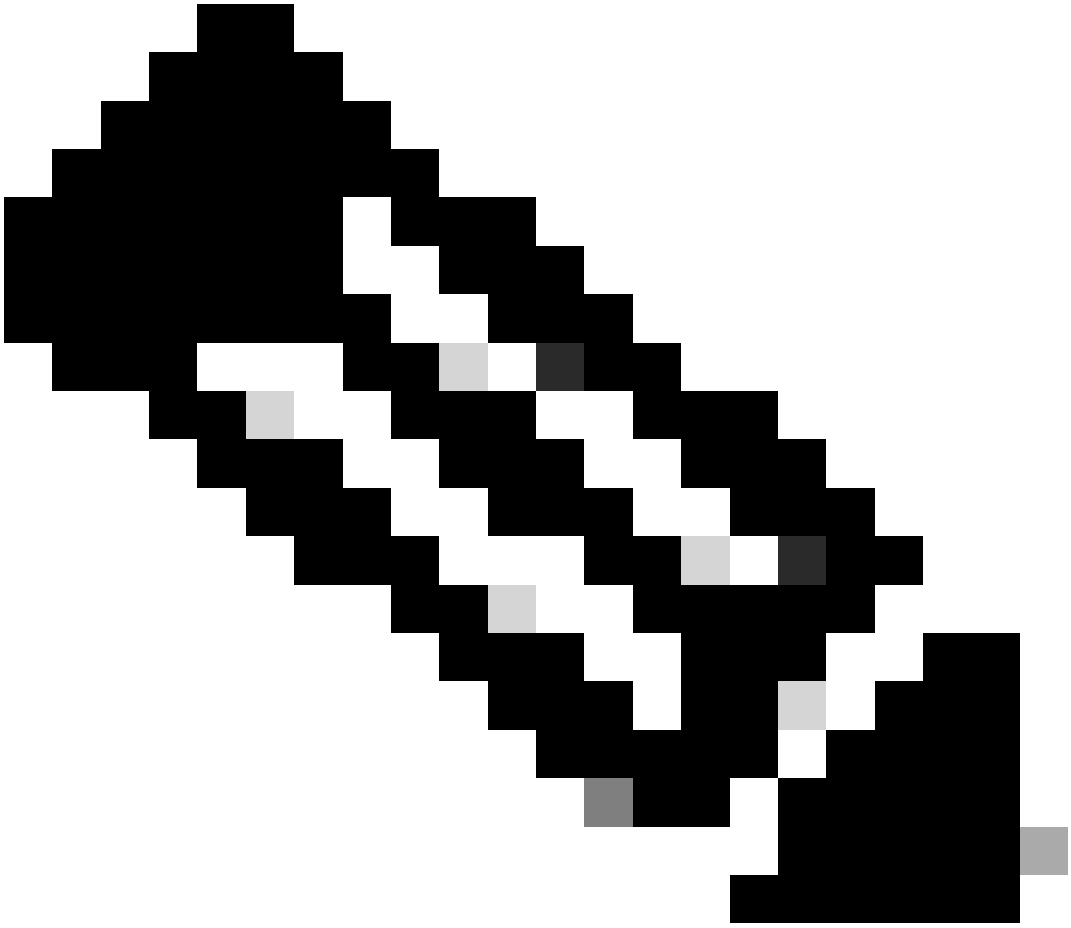
```
DHCP snooping is operational on following VLANs:
```

```
101,201
```

配置（部分隔离保护）

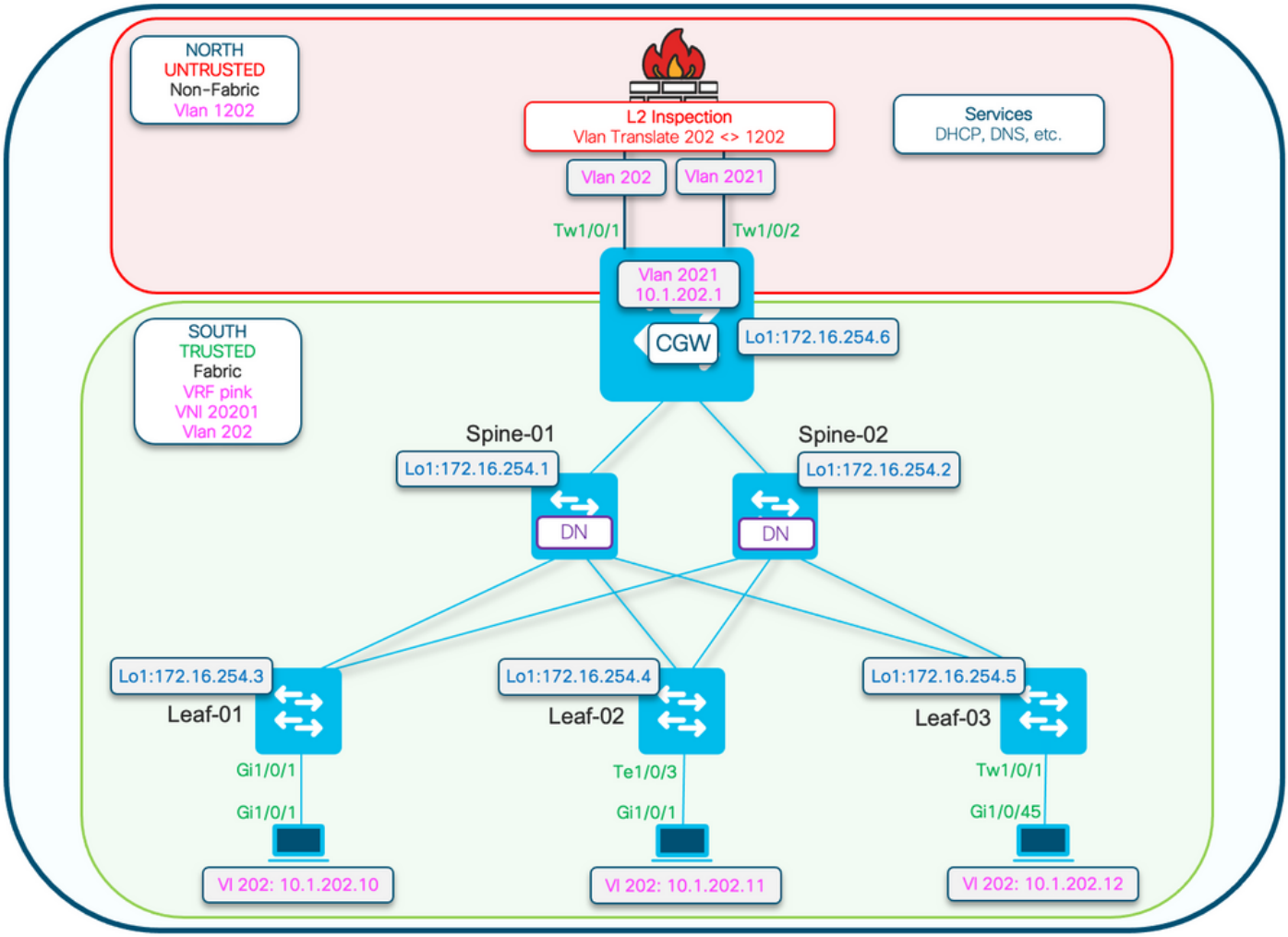
接入枝叶上的DHCP监听依靠来自CGW的默认网关路由来获知用于将DHCP数据包转发到的网关MAC。

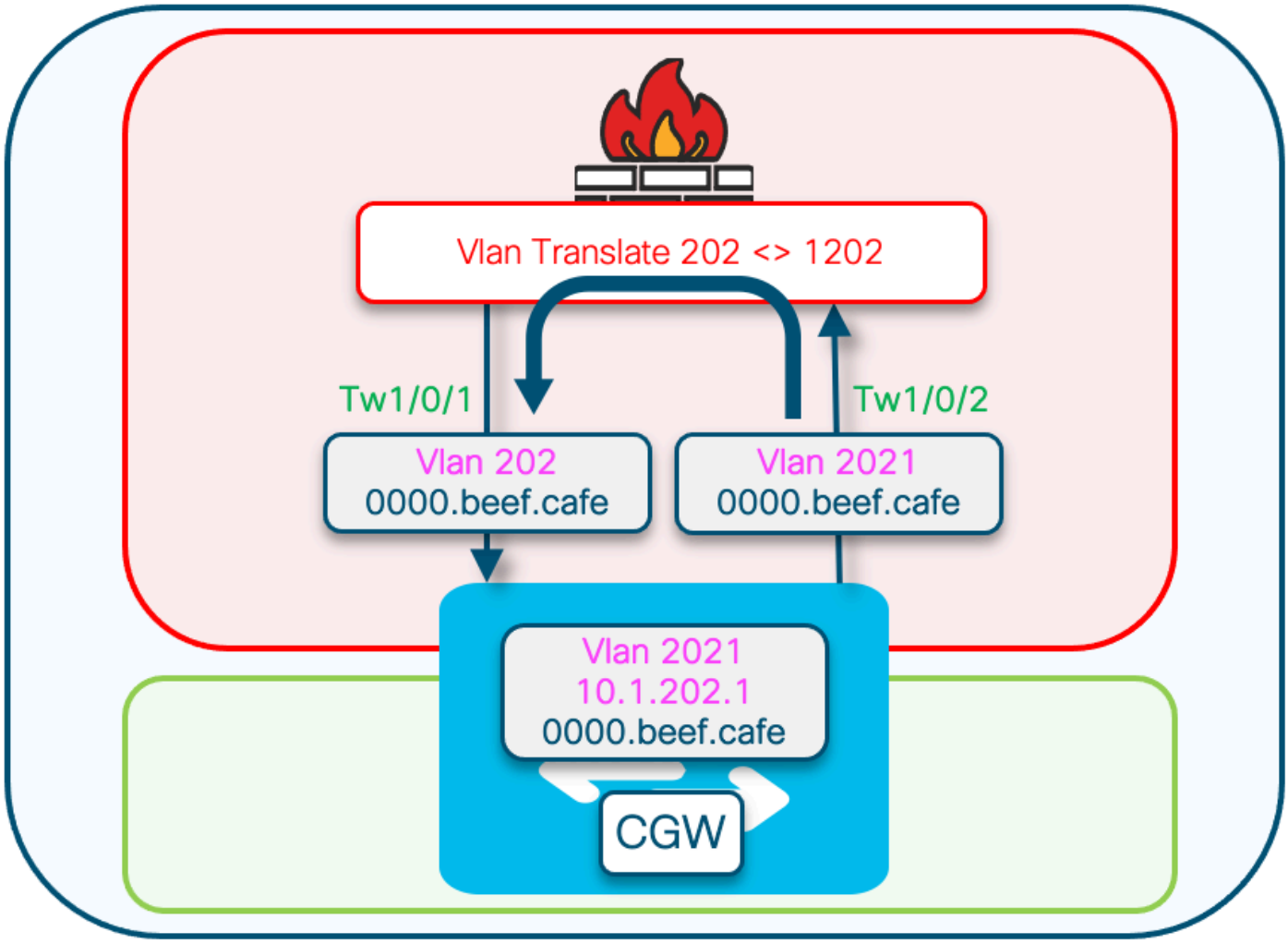
- 使用带有外部网关的部分隔离设计时，在CGW上需要额外的配置才能使用默认网关(DEF GW)属性通告MAC-IP RT2。



注：注：此部分还用于描述完全隔离受保护网段实施，该实施还使用通告到交换矩阵中的GW（与交换矩阵外部的GW）。

网络图


NORTH
UNTRUSTED
Non-Fabric
Vlan 1202
L2 Inspection
Vlan Translate 202 <> 1202
Services
DHCP, DNS, etc.
Vlan 202
Vlan 2021
Tw1/0/1
Tw1/0/2
Vlan 2021
10.1.202.1
CGW
Lo1:172.16.254.6
SOUTH
TRUSTED
Fabric
VRF pink
VNI 20201
Vlan 202
Spine-01
Lo1:172.16.254.1
DN
Spine-02
Lo1:172.16.254.2
DN
Lo1:172.16.254.3
Leaf-01
Lo1:172.16.254.4
Leaf-02
Lo1:172.16.254.5
Leaf-03
Gi1/0/1
Gi1/0/1
Te1/0/3
Gi1/0/1
Tw1/0/1
Gi1/0/45
Vl 202: 10.1.202.10
Vl 202: 10.1.202.11
Vl 202: 10.1.202.12



L2 VTEP（枝叶）密钥详细信息

请求数据包来自客户端

- 使用Default gw advertised CGW mac。
- 如果存在多个gw，则使用第一个gw mac。
- 将外部广播MAC（客户端发起：DORA中的D和R）转换为单播GW MAC并转发到CGW

DHCP监听添加：选项82子选项：电路和RID

（RID由CGW上的响应数据包处理使用）。

(通知CGW其非本地和交换矩阵中继返回L2VTEP)

<#root>

```
Option: (82) Agent Information Option
        Length: 24
```

```
        Option 82 Suboption: (1) Agent Circuit ID
            Length: 12
            Agent Circuit ID: 010a000800000277501010000

        Option 82 Suboption: (2) Agent Remote ID

            Length: 8
          Agent Remote ID:
          000

682c7bf88700 <-- switch base mac 682c.7bf8.8700 (from 'show switch')
```

- 通过vxlan隧道从CGW接收的响应数据包。
- Leaf Strips选项82。
- 添加带有客户端源接口的绑定条目。（vxlan-mod-port提供客户端源接口）。
- 转发到客户端的响应数据包。

L3 VTEP (CGW)密钥详细信息

- 启用DHCP监听
- 在SVI中启用DHCP中继
- 从L2VTEP接收请求，并将其提供给中继。
- 中继添加其他选项82子选项（gi、服务器覆盖等）并发送到DHCP服务器。
- 来自dhcp服务器的DHCP响应首先进入RELAY组件。
- 在RELAY删除选项82参数（gi地址、服务器覆盖等）后，数据包将传递到dhcp监听组件。
- 监听组件检查RID（路由器ID），如果它不是本地路由器，则不会删除选项82子选项1和2。
- 交换矩阵中继（因为RID不是本地的）数据包直接转发到远程客户端。
- 使用客户端Mac并执行网桥插入。 硬件执行客户端mac查找，并将具有vxlan封装的数据包转发到始发L2VTEP。

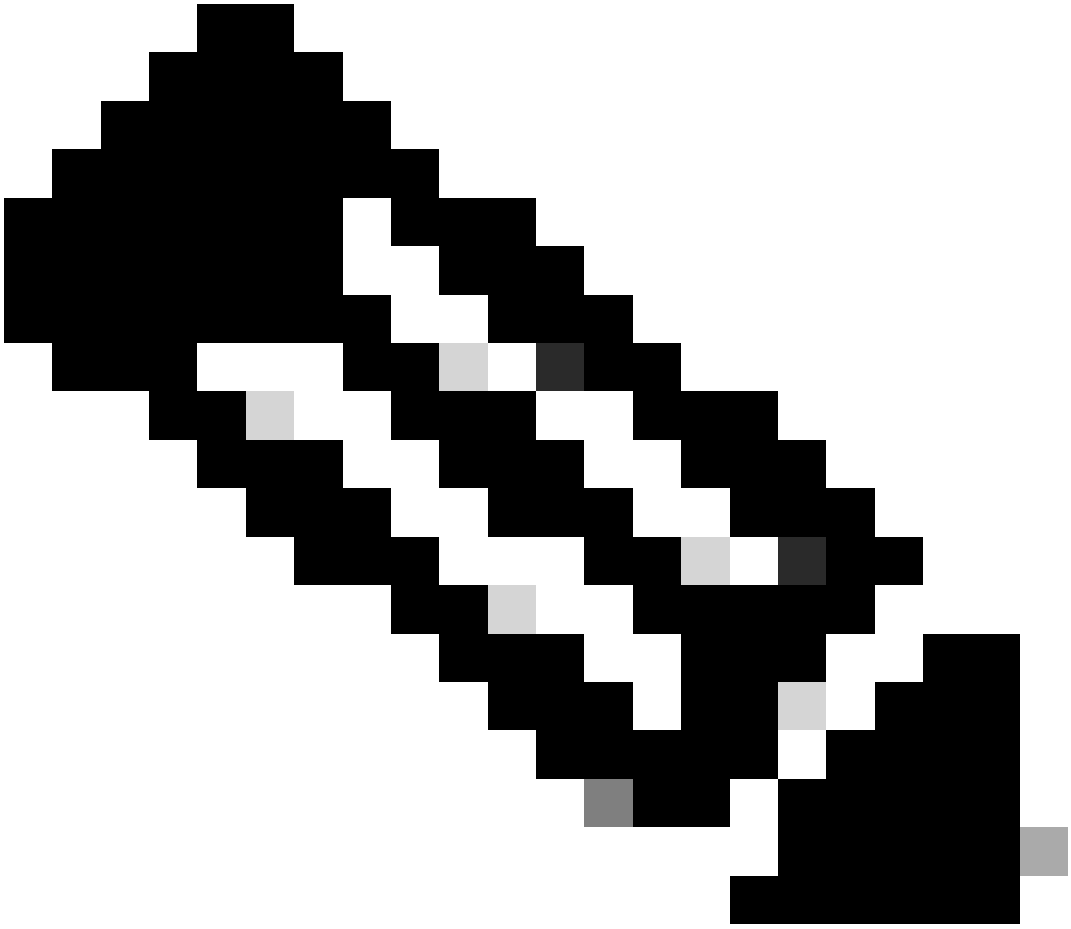
支持DHCP L2中继所需的步骤：

1. 启用ip local learning
2. 创建禁用收集功能的策略
3. 连接到外部网关EVI/VLAN
4. 将静态条目添加到外部网关mac-ip的设备跟踪表中
5. 创建BGP路由映射以匹配RT2 MAC-IP前缀并设置默认网关扩展社区

6. 将路由映射应用到BGP路由反射器邻居

7. 确保DHCP中继的配置正确以处理其他选项

8. 在交换矩阵VLAN和外部GW VLAN上配置DHCP监听



注意：无需在接入枝叶上进行配置更改即可支持带有外部网关的DHCP L2中继。

CGW

启用ip local learning

<#root>

CGW#

show running-config | beg l2vpn evpn instance 202

l2vpn evpn instance 202 vlan-based

```
 encapsulation vxlan
 replication-type ingress
 ip local-learning enable


<-- to advertise RT-2 with default gateway EC, ip local-learning must be enabled on the CGW.


    Use additional device-tracking policy shown in the next output to prevent MAC-IP binding flapping wh
 multicast advertise enable
<--- There is no default-gateway advertise enable cli here, as the SVI (Vlan 2021) used by this segment
```

创建禁用收集功能的策略

```
<#root>
device-tracking policy dt-no-glean <-- Configure device tracking policy to prevent MAC-IP flapping
 security-level glean
 no protocol ndp
 no protocol dhcp6
 no protocol arp
 no protocol dhcp4
```

连接到外部网关evi/vlan

```
<#root>
CGW#
show running-config | sec vlan config
vlan configuration 202
 member evpn-instance 202 vni 20201
 device-tracking attach-policy dt-no-glean <-- apply the new device tracking policy to the vlan configur
```

将静态条目添加到外部网关mac-ip的设备跟踪表中

```
<#root>
device-tracking binding vlan 202 10.1.202.1 interface TwentyFiveGigE1/0/1 0000.beef.cafe
<-- All static entries in device tracking table should be for external gateway mac-ip's.
```

```
    If there is any other static entry in device tracking table, match ip/ipv6 configurations in route m
```

创建BGP路由映射以匹配RT2 MAC-IP前缀并设置默认网关扩展社区

<#root>

```
route-map CGW_DEF_GW permit 10
 match evpn route-type 2-mac-ip <-- match RT2 type MAC-IP


 set extcommunity default-gw    <-- Set Default-gateway (DEF GW 0:0) extended community

route-map CGW_DEF_GW permit 20
```

将路由映射应用到BGP路由反射器邻居

<#root>

```
CGW#
sh run | sec router bgp


address-family l2vpn evpn
 neighbor 172.16.255.1 activate
 neighbor 172.16.255.1 send-community both
 neighbor 172.16.255.1
route-map CGW_DEF_GW out  <-- Sets the DEF GW Community when it advertises MAC-IP type RT2 to the RR


 neighbor 172.16.255.2 activate
 neighbor 172.16.255.2 send-community both
 neighbor 172.16.255.2
route-map CGW_DEF_GW out <-- Sets the DEF GW Community when it advertises MAC-IP type RT2 to the RR
```

确保DHCP中继的配置正确以处理其他选项

<#root>

```
CGW#
show run int vl 2021
Building configuration...

Current configuration : 315 bytes
!
interface Vlan2021
 mac-address 0000.beef.cafe
```

```
 vrf forwarding pink

 ip dhcp relay information option vpn-id   <-- Ensure the vrf info is passed to the server
 ip dhcp relay source-interface Loopback0  <-- sets the relay source interface to the loopback

 ip address 10.1.202.1 255.255.255.0

 ip helper-address global 10.1.33.33       <-- In this scenario the next hop to the DHCP server is in th

 no ip redirects
 ip local-proxy-arp
 ip route-cache same-interface
 no autostate
```

在交换矩阵VLAN和外部GW VLAN上配置DHCP监听

<#root>

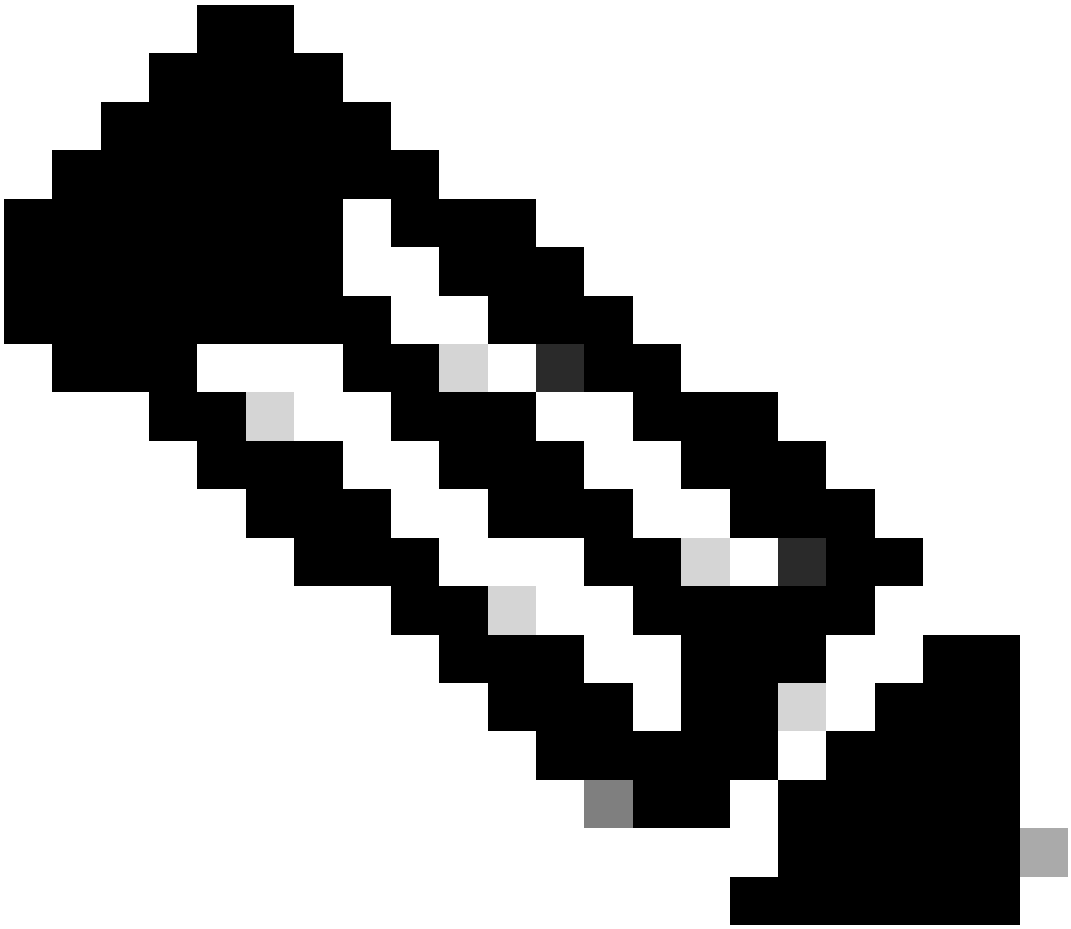
```
Leaf01#

sh run | s dhcp snoop

ip dhcp snooping vlan 202
ip dhcp snooping

CGW#

sh run | s dhcp snoop

ip dhcp snooping vlan 202,2021  <-- snooping is required in both the fabric vlan and the external GW vla

ip dhcp snooping
```

确保到DHCP服务器的上行链路在CGW上受信任

<#root>

```
CGW#

sh run int tw 1/0/1


interface TwentyFiveGigE1/0/1
 switchport trunk allowed vlan 202
 switchport mode trunk

 ip dhcp snooping trust

end

CGW#

sh run int tw 1/0/2


interface TwentyFiveGigE1/0/2
 switchport trunk allowed vlan 33,2021
 switchport mode trunk
```

```
 ip dhcp snooping trust
end
```



注意：由于服务器在防火墙设备上的放置方式，因此两个面向此设备的链路上都配置了信任。在放大图中，您可以看到此设计中的Offer同时到达Tw1/0/1和Tw1/0/2。

验证（部分隔离保护）

网关前缀（枝叶）

<#root>

```
Leaf01#
show bgp l2vpn evpn route-type 2 0 0000.beef.cafe 10.1.202.1
```

```
BGP routing table entry for [2][172.16.254.3:202][0][48][0000BEEFCAFE][32][10.1.202.1]/24, version 3411
Paths: (1 available, best #1, table evi_202)
  Not advertised to any peer
  Refresh Epoch 2
  Local, imported path from [2][172.16.254.6:202][0][48][0000BEEFCAFE][32][10.1.202.1]/24 (global)
    172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      EVPN ESI: 00000000000000000000, Label1 20201
      Extended Community: RT:65001:202 ENCAP:8
```

EVPN DEF GW:0:0 <-- GW attribute added indicating this is GW prefix which L2 Relay uses

```
      Originator: 172.16.255.6, Cluster list: 172.16.255.1
      rx pathid: 0, tx pathid: 0x0
      Updated on Sep 19 2023 19:57:25 UTC
```

FED MATM（枝叶）

确认枝叶已在硬件中安装CGW远程MAC

<#root>

```
Leaf01#
```

show platform software fed switch active matm macTable vlan 202

```
VLAN   MAC                 Type  Seq#    EC_Bi  Flags  machandle          siHandle           riHandl
-------------------------------------------------------------------------------------------------
202    0006.f601.cd01       0x1    1093      0      0  0x71e05918f138     0x71e05917a1a8     0x0

202    0006.f601.cd44       0x1   14309      0      0  0x71e058cdc208     0x71e05917a1a8     0x0
```

202

0000.beef.cafe 0x5000001

```
      0      0     64  0x71e058ee5d88      0x71e059195f88      0x71e059171678      0x0
```

<--- The GW MAC shows learnt via the Border Leaf Loopback

```
Total Mac number of addresses:: 3
Summary:
Total number of secure addresses:: 0
Total number of drop addresses:: 0
Total number of lisp local addresses:: 0
Total number of lisp remote addresses:: 1
*a_time=aging_time(secs)  *e_time=total_elapsed_time(secs)
Type:
```

MAT_DYNAMIC_ADDR 0x1

```
  MAT_STATIC_ADDR       0x2  MAT_CPU_ADDR          0x4  MAT_DISCARD_ADDR      0x8
MAT_ALL_VLANS          0x10  MAT_NO_FORWARD       0x20  MAT_IPMULT_ADDR       0x40  MAT_RES
MAT_DO_NOT_AGE        0x100  MAT_SECURE_ADDR     0x200  MAT_NO_PORT          0x400  MAT_DRO
MAT_DUP_ADDR         0x1000  MAT_NULL_DESTINATION 0x2000  MAT_DOT1X_ADDR      0x4000  MAT_ROU
MAT_WIRELESS_ADDR   0x10000  MAT_SECURE_CFG_ADDR 0x20000  MAT_OPQ_DATA_PRESENT 0x40000  MAT_WIR
MAT_DLR_ADDR       0x100000  MAT_MRP_ADDR       0x200000  MAT_MSRP_ADDR      0x400000  MAT_LIS
```

MAT_LISP_REMOTE_ADDR 0x1000000

MAT_VPLS_ADDR

0x2000000 MAT_LISP_GW_ADDR 0x4000000

<-- these 3 values added = 0x5000001 (note that 0x4000000 = GW type address

本地MAC（枝叶）

<#root>

Leaf01#

show switch

```
Switch/Stack Mac Address : 682c.7bf8.8700 - Local Mac Address
Mac persistency wait time: Indefinite
                                             H/W   Current
Switch#   Role    Mac Address     Priority Version  State
------------------------------------------------------------------------------------
*1       Active
```

682c.7bf8.8700

```
     1      V01     Ready
```

<-- this is the MAC that will be added to DHCP Agent Remote ID

DHCP监听（枝叶和CGW）

确认已在交换矩阵vlan中的枝叶上启用DHCP监听

<#root>

Leaf01#

show ip dhcp snooping

```
Switch DHCP snooping is enabled
Switch DHCP gleaning is disabled
DHCP snooping is configured on following VLANs:
202
```

DHCP snooping is operational on following VLANs: <-- Snooping on in the Fabric Vlan 202

```
<...snip...>
```

Insertion of option 82 is enabled
circuit-id default format: vlan-mod-port
remote-id: 682c.7bf8.8700 (MAC) <--- Remote ID (RID) inserted by Leaf to DHCP packets

```
<...snip...>
```

确认已在交换矩阵和外部网关vlan中的CGW上启用DHCP监听

<#root>

CGW#

show ip dhcp snooping

Switch DHCP snooping is enabled
Switch DHCP gleaning is disabled
DHCP snooping is configured on following VLANs:
202,2021

DHCP snooping is operational on following VLANs: <-- Snooping on in the Fabric and External GW Vlans 202,2021

<...snip...>

DHCP snooping trust/rate is configured on the following Interfaces:

Interface   Trusted   Allow option   Rate limit (pps)
-----------------------   -------   ------------   ----------------

TwentyFiveGigE1/0/1

             yes   yes   unlimited

<-- Trust set on ports the OFFER arrives on

Interface   Trusted   Allow option   Rate limit (pps)
-----------------------   -------   ------------   ----------------
  Custom circuit-ids:

TwentyFiveGigE1/0/2

              yes   yes   unlimited

<-- Trust set on ports the OFFER arrives on

  Custom circuit-ids:

确认已创建DHCP监听绑定

<#root>

Leaf01#

show ip dhcp snooping binding

MacAddress

IpAddress

        Lease(sec) Type   VLAN

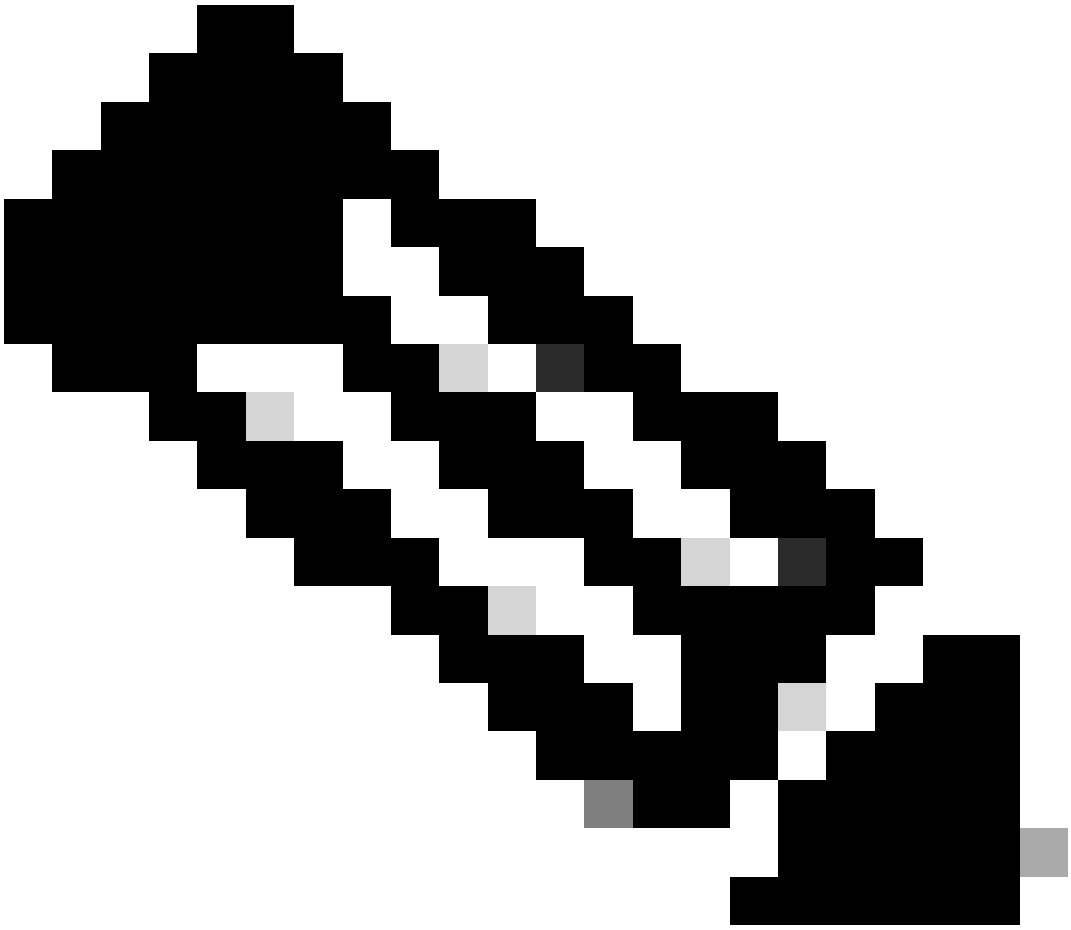
Interface

----------------- -------------- ---------- ------------- ---- --------------------

```
00:06:F6:01:CD:43
10.1.202.10
      34261       dhcp-snooping   202
GigabitEthernet1/0/1  <-- DHCP Snooping has created the binding
Total number of bindings: 1
```

故障排除（任何CGW类型）

调试有助于显示DHCP监听和L2中继进程如何处理DHCP数据包。



注意：这些调试可用于任何类型的使用带DCHP L2中继的CGW的部署。

DHCP监听调试（枝叶）

调试监听以确认数据包处理

<#root>

Leaf01#

debug ip dhcp snooping packet

DHCP Snooping Packet debugging is on

Leaf01#

show debugging

DHCP Snooping packet debugging is on

开始主机DHCP地址尝试

- 对于本文档，执行通过DHCP寻址的SVI的关闭/不关闭以触发DORA交换
- 对于Windows主机，可以执行ipconfig /release > ipconfig /renew

从show logging或终端窗口收集调试

DHCP 发现

发现来自面向主机的端口

<#root>

*Sep 19 20:16:31.164:

DHCP_SNOOPING: received new DHCP packet from input interface (GigabitEthernet1/0/1) <-- host facing por

*Sep 19 20:16:31.177:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPDISCOVER, input interface: Gi1/0/1

, MAC da: ffff.ffff.ffff,

MAC sa: 0006.f601.cd43

, IP da: 255.255.255.255, IP sa: 0.0.0.0, DHCP ciaddr: 0.0.0.0, DHCP yiaddr: 0.0.0.0, DHCP siaddr: 0.0.
*Sep 19 20:16:31.177: DHCP_SNOOPING: add relay information option.
*Sep 19 20:16:31.177:

DHCP_SNOOPING: Encoding opt82 CID in vlan-mod-port format   <-- Option 82 encoding

*Sep 19 20:16:31.177: DHCP_SNOOPING:VxLAN : vlan_id 202 VNI 20201 mod 1 port 1
*Sep 19 20:16:31.177:

DHCP_SNOOPING: Encoding opt82 RID in MAC address format   <-- Encoding the switch Remote ID (loc

*Sep 19 20:16:31.177: DHCP_SNOOPING: binary dump of relay info option, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6

0x68 0x2C 0x7B 0xF8 0x87 0x0 <-- the switch local MAC 682c.7bf8.8700

```
*Sep 19 20:16:31.177: DHCPS BRIDGE PAK: vlan=202 platform_flags=1
*Sep 19 20:16:31.177: DHCP_SNOOPING: bridge packet get invalid mat entry: FFFF.FFFF.FFFF, packet is flo
*Sep 19 20:16:31.177:

DHCP_SNOOPING: L2RELAY: sent unicast packet to default gw: 0000.beef.cafe vlan 0 src intf GigabitEtherne
```

DHCP 提供

发现优惠从交换矩阵隧道接口到达

<#root>

```
*Sep 19 20:16:33.180:

DHCP_SNOOPING: received new DHCP packet from input interface (Tunnel0)

*Sep 19 20:16:33.194:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPOFFER, input interface: Tu0, MAC da: 0006.f601

, IP da: 255.255.255.255, IP sa: 10.1.202.1, DHCP ciaddr: 0.0.0.0, DHCP yiaddr: 10.1.202.18, DHCP siadd
*Sep 19 20:16:33.194: DHCP_SNOOPING: binary dump of option 82, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Sep 19 20:16:33.194: DHCP_SNOOPING: binary dump of extracted circuit id, length: 14 data:
0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0
*Sep 19 20:16:33.194: DHCP_SNOOPING: binary dump of extracted remote id, length: 10 data:
0x2 0x8 0x0 0x6

0x68 0x2C 0x7B 0xF8 0x87 0x0                                    <-- the switch local MAC 682c.7bf8.8700

*Sep 19 20:16:33.194:  actual_fmt_cid OPT82_FMT_CID_VXLAN_MOD_PORT_INTF global_opt82_fmt_rid OPT82_FMT_
*Sep 19 20:16:33.194: dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan
*Sep 19 20:16:33.194:

DHCP_SNOOPING: opt82 data indicates local packet      <-- switch found its own RID in Option 82 paramete


*Sep 19 20:16:33.194: DHCP_SNOOPING: remove relay information option.
*Sep 19 20:16:33.194: DHCP_SNOOPING opt82_fmt_cid_intf OPT82_FMT_CID_VXLAN_MOD_PORT_INTF opt82_fmt_cid_
*Sep 19 20:16:33.194:

DHCP_SNOOPING: VxLAN vlan_id 202 VNI 20201 mod 1 port 1

*Sep 19 20:16:33.194:

DHCP_SNOOPING: mod 1 port 1 idb Gi1/0/1 found for 0006.f601.cd43

*Sep 19 20:16:33.194: DHCP_SNOOPING: calling forward_dhcp_reply
*Sep 19 20:16:33.194: platform lookup dest vlan for input_if: Tunnel0, is  tunnel, if_output: NULL, if_
*Sep 19 20:16:33.194: DHCP_SNOOPING opt82_fmt_cid_intf OPT82_FMT_CID_VXLAN_MOD_PORT_INTF opt82_fmt_cid_
*Sep 19 20:16:33.194: DHCP_SNOOPING: VxLAN vlan_id 202 VNI 20201 mod 1 port 1
*Sep 19 20:16:33.194: DHCP_SNOOPING: mod 1 port 1 idb Gi1/0/1 found for 0006.f601.cd43
*Sep 19 20:16:33.194: DHCP_SNOOPING: vlan 202 after pvlan check
*Sep 19 20:16:33.207:

DHCP_SNOOPING: direct forward dhcp replyto output port: GigabitEthernet1/0/1.  <-- sending packet to hos
```

DHCP 请求

从面向主机的端口看到请求

<#root>

*Sep 19 20:16:33.209:

DHCP_SNOOPING: received new DHCP packet from input interface (GigabitEthernet1/0/1)

*Sep 19 20:16:33.222:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPREQUEST

, input interface: Gi1/0/1, MAC da: ffff.ffff.ffff, MAC sa: 0006.f601.cd43, IP da: 255.255.255.255, IP
*Sep 19 20:16:33.222: DHCP_SNOOPING: add relay information option.
*Sep 19 20:16:33.222: DHCP_SNOOPING: Encoding opt82 CID in vlan-mod-port format
*Sep 19 20:16:33.222: DHCP_SNOOPING:VxLAN : vlan_id 202 VNI 20201 mod 1 port 1
*Sep 19 20:16:33.222: DHCP_SNOOPING: Encoding opt82 RID in MAC address format
*Sep 19 20:16:33.222: DHCP_SNOOPING: binary dump of relay info option, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Sep 19 20:16:33.222: DHCPS BRIDGE PAK: vlan=202 platform_flags=1
*Sep 19 20:16:33.222: DHCP_SNOOPING: bridge packet get invalid mat entry: FFFF.FFFF.FFFF, packet is flo
*Sep 19 20:16:33.222:

DHCP_SNOOPING: L2RELAY: sent unicast packet to default gw: 0000.beef.cafe vlan 0 src intf GigabitEtherne

DHCP确认

发现确认从交换矩阵隧道接口到达

<#root>

*Sep 19 20:16:33.225:

DHCP_SNOOPING: received new DHCP packet from input interface (Tunnel0)

*Sep 19 20:16:33.238:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPACK, input interface: Tu0, MAC da: 0006.f601.c

, IP da: 255.255.255.255, IP sa: 10.1.202.1, DHCP ciaddr: 0.0.0.0, DHCP yiaddr: 10.1.202.10, DHCP siadd
*Sep 19 20:16:33.238: DHCP_SNOOPING: binary dump of option 82, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Sep 19 20:16:33.239: DHCP_SNOOPING: binary dump of extracted circuit id, length: 14 data:
0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0
*Sep 19 20:16:33.239: DHCP_SNOOPING: binary dump of extracted remote id, length: 10 data:
0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8 0x87 0x0
*Sep 19 20:16:33.239: actual_fmt_cid OPT82_FMT_CID_VXLAN_MOD_PORT_INTF global_opt82_fmt_rid OPT82_FMT_
*Sep 19 20:16:33.239: dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan
*Sep 19 20:16:33.239:

DHCP_SNOOPING: opt82 data indicates local packet

*Sep 19 20:16:33.239:

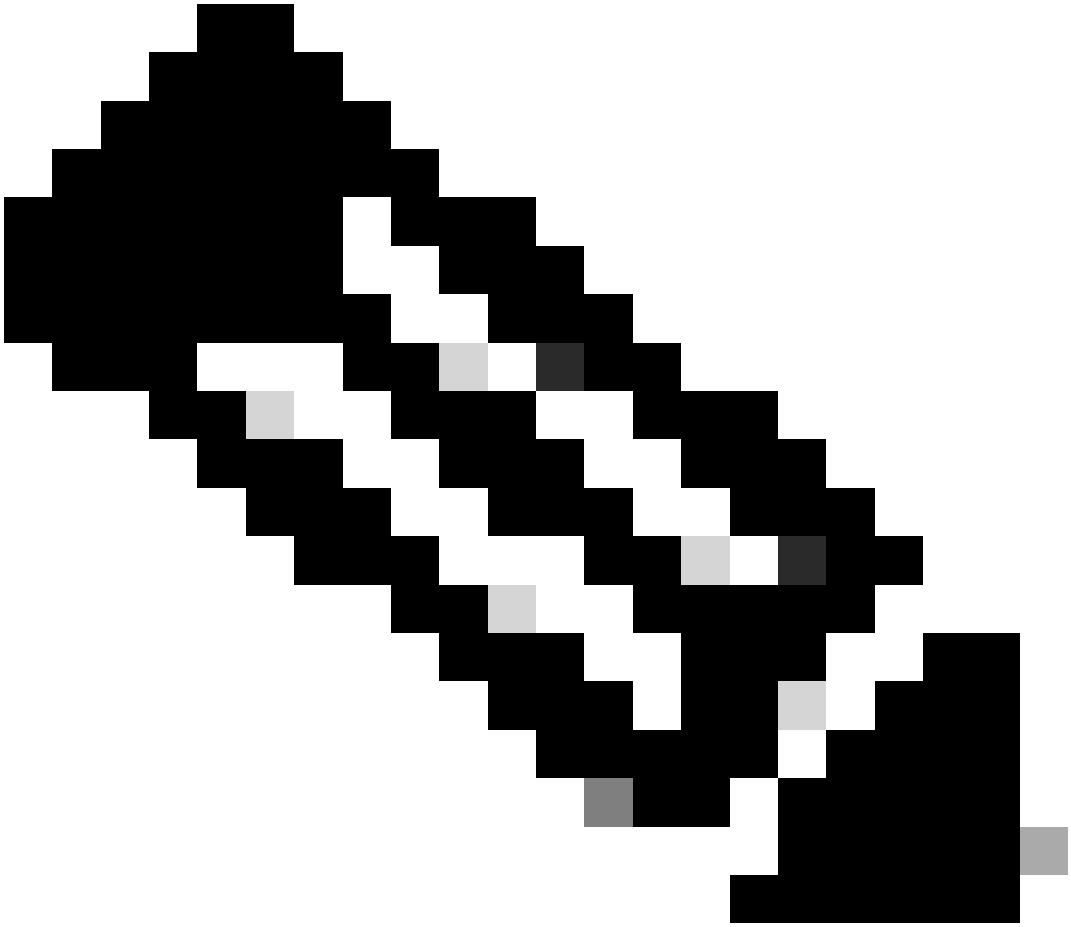
dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan_id 202

```
*Sep 19 20:16:33.239: DHCP_SNOOPING: opt82 data indicates local packet
*Sep 19 20:16:33.239: DHCP_SNOOPING opt82_fmt_cid_intf OPT82_FMT_CID_VXLAN_MOD_PORT_INTF opt82_fmt_cid_
*Sep 19 20:16:33.239: DHCP_SNOOPING: VxLAN vlan_id 202 VNI 20201 mod 1 port 1
*Sep 19 20:16:33.239:
```

DHCP_SNOOPING: mod 1 port 1 idb Gi1/0/1 found for 0006.f601.cd43

```
*Sep 19 20:16:33.239: DHCP_SNOOPING: Reroute dhcp pak, message type: DHCPACK
*Sep 19 20:16:33.239: DHCP_SNOOPING: remove relay information option.
*Sep 19 20:16:33.239: DHCP_SNOOPING opt82_fmt_cid_intf OPT82_FMT_CID_VXLAN_MOD_PORT_INTF opt82_fmt_cid_
*Sep 19 20:16:33.239: DHCP_SNOOPING: VxLAN vlan_id 202 VNI 20201 mod 1 port 1
*Sep 19 20:16:33.239: DHCP_SNOOPING: mod 1 port 1 idb Gi1/0/1 found for 0006.f601.cd43
*Sep 19 20:16:33.239: DHCP_SNOOPING: calling forward_dhcp_reply
*Sep 19 20:16:33.239: platform lookup dest vlan for input_if: Tunnel0, is  tunnel, if_output: NULL, if_
*Sep 19 20:16:33.239: DHCP_SNOOPING opt82_fmt_cid_intf OPT82_FMT_CID_VXLAN_MOD_PORT_INTF opt82_fmt_cid_
*Sep 19 20:16:33.239: DHCP_SNOOPING: VxLAN vlan_id 202 VNI 20201 mod 1 port 1
*Sep 19 20:16:33.239: DHCP_SNOOPING: mod 1 port 1 idb Gi1/0/1 found for 0006.f601.cd43
*Sep 19 20:16:33.239: DHCP_SNOOPING: vlan 202 after pvlan check
*Sep 19 20:16:33.252:
```

DHCP_SNOOPING: direct forward dhcp replyto output port: GigabitEthernet1/0/1.



注意：这些调试会被截取。它们会生成数据包的内存转储，但调试结果的此部分注释不在本文档的讨论范围之内。

DHCP监听调试(CGW)

DHCP 发现

由于数据包在CGW上发送和接收的方式（在防火墙上迂回），调试会触发两次

从隧道接口上的交换矩阵到达并从Tw 1/0/1发送到交换矩阵VLAN 202中的防火墙

```
<#root>

*Apr 16 14:37:43.890:

 DHCP_SNOOPING: received new DHCP packet from input interface (Tunnel0)  <-- Discover sent from Leaf01 a


*Apr 16 14:37:43.901: DHCP_SNOOPING: process new DHCP packet, message type: DHCPDISCOVER, input interfa
*Apr 16 14:37:43.901: DHCPS BRIDGE PAK: vlan=202 platform_flags=1
*Apr 16 14:37:43.901:

DHCP_SNOOPING: bridge packet send packet to port: TwentyFiveGigE1/0/1, pak_vlan 202. <-- Sent to Firewal
```

从Vlan 2021中Tw 1/0/2上的防火墙到达，将发送到SVI和帮助程序到DHCP服务器

```
<#root>

*Apr 16 14:37:43.901:

DHCP_SNOOPING: received new DHCP packet from input interface (TwentyFiveGigE1/0/2) <-- Firewall sends di


*Apr 16 14:37:43.911: DHCP_SNOOPING: process new DHCP packet, message type: DHCPDISCOVER, input interfa
*Apr 16 14:37:43.911:

DHCPS BRIDGE PAK: vlan=2021 platform_flags=1      <-- Vlan discover seen is now 2021


*Apr 16 14:37:43.911:

DHCP_SNOOPING: Packet destined to SVI Mac:0000.beef.cafe


*Apr 16 14:37:43.911:

DHCP_SNOOPING: bridge packet send packet to cpu port: Vlan2021.  <-- Packet punted to CPU for handling b
```

DHCP 提供

从DHCP服务器返回SVI 2021，在此配置帮助程序并将其转发到防火墙

<#root>

*Apr 16 14:37:45.913:

DHCP_SNOOPING: received new DHCP packet from input interface (Vlan2021) <-- Arriving from the DHCP serv

*Apr 16 14:37:45.923:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPOFFER, input interface: Vl2021

, MAC da: ffff.ffff.ffff, MAC sa: 0000.beef.cafe, IP da: 255.255.255.255, IP sa: 10.1.202.1, DHCP ciadd
*Apr 16 14:37:45.923: DHCP_SNOOPING: binary dump of option 82, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Apr 16 14:37:45.924: DHCP_SNOOPING: binary dump of extracted circuit id, length: 14 data:
0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0
*Apr 16 14:37:45.924: DHCP_SNOOPING: binary dump of extracted remote id, length: 10 data:
0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8 0x87 0x0
*Apr 16 14:37:45.924: actual_fmt_cid OPT82_FMT_CID_VXLAN_MOD_PORT_INTF global_opt82_fmt_rid OPT82_FMT_R
*Apr 16 14:37:45.924: dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan
*Apr 16 14:37:45.924:

DHCP_SNOOPING: opt82 data indicates not a local packet

*Apr 16 14:37:45.924: DHCP_SNOOPING: can't parse option 82 data of the message,it is either in wrong fo

<-- This is expected even in working scenario (disregard it)

*Apr 16 14:37:45.924: DHCP_SNOOPING: calling forward_dhcp_reply
*Apr 16 14:37:45.924: platform lookup dest vlan for input_if: Vlan2021, is NOT tunnel, if_output: Vlan2
*Apr 16 14:37:45.924: DHCP_SNOOPING: vlan 2021 after pvlan check
*Apr 16 14:37:45.934:

DHCP_SNOOPING: direct forward dhcp replyto output port: TwentyFiveGigE1/0/2. <-- sending back toward the

从交换矩阵VLAN中的防火墙到达，并从CGW发送到交换矩阵到枝叶

<#root>

*Apr 16 14:37:45.934:

DHCP_SNOOPING: received new DHCP packet from input interface (TwentyFiveGigE1/0/1)

*Apr 16 14:37:45.944:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPOFFER, input interface: Twe1/0/1

, MAC da: ffff.ffff.ffff, MAC sa: 0000.beef.cafe, IP da: 255.255.255.255, IP sa: 10.1.202.1, DHCP ciadd
*Apr 16 14:37:45.944: DHCP_SNOOPING: binary dump of option 82, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Apr 16 14:37:45.944: DHCP_SNOOPING: binary dump of extracted circuit id, length: 14 data:
0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0
*Apr 16 14:37:45.944: DHCP_SNOOPING: binary dump of extracted remote id, length: 10 data:

```
0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8 0x87 0x0
*Apr 16 14:37:45.944: actual_fmt_cid OPT82_FMT_CID_VXLAN_MOD_PORT_INTF global_opt82_fmt_rid OPT82_FMT_R
*Apr 16 14:37:45.944: dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan
*Apr 16 14:37:45.945:
```

DHCP_SNOOPING: opt82 data indicates not a local packet

```
*Apr 16 14:37:45.945: DHCP_SNOOPING: EVPN enabled Ex GW:fabric relay can't parse option 82 data of the
*Apr 16 14:37:45.945: DHCP_SNOOPING: client address lookup failed to locate client interface, retry loo
*Apr 16 14:37:45.945: DHCP_SNOOPING: lookup packet destination port failed to get mat entry for mac: 00
*Apr 16 14:37:45.945:
```

DHCP_SNOOPING: L2RELAY: Ex GW unicast bridge packet to fabric: vlan id 202 from Twe1/0/1 <-- L2 RELAY f

DHCP 请求

<#root>

```
*Apr 16 14:37:45.967:
```

DHCP_SNOOPING: received new DHCP packet from input interface (Tunnel0)

```
*Apr 16 14:37:45.978:
```

DHCP_SNOOPING: process new DHCP packet, message type: DHCPREQUEST

```
, input interface: Tu0, MAC da: 0000.beef.cafe, MAC sa: 0006.f601.cd43, IP da: 255.255.255.255, IP sa:
*Apr 16 14:37:45.978: DHCPS BRIDGE PAK: vlan=202 platform_flags=1
*Apr 16 14:37:45.978:
```

DHCP_SNOOPING: bridge packet send packet to port: TwentyFiveGigE1/0/1, pak_vlan 202. <-- Send toward Fir

<#root>

```
*Apr 16 14:37:45.978:
```

DHCP_SNOOPING: received new DHCP packet from input interface (TwentyFiveGigE1/0/2) <-- Receive from Fire

```
*Apr 16 14:37:45.989:
```

DHCP_SNOOPING: process new DHCP packet, message type: DHCPREQUEST

```
, input interface: Twe1/0/2, MAC da: 0000.beef.cafe, MAC sa: 0006.f601.cd43, IP da: 255.255.255.255, IP
*Apr 16 14:37:45.989: DHCPS BRIDGE PAK: vlan=2021 platform_flags=1
*Apr 16 14:37:45.989: DHCP_SNOOPING: Packet destined to SVI Mac:0000.beef.cafe
*Apr 16 14:37:45.989:
```

DHCP_SNOOPING: bridge packet send packet to cpu port: Vlan2021. <-- Punt to CPU / DHCP helper

DHCP确认

<#root>

*Apr 16 14:37:45.990:

DHCP_SNOOPING: received new DHCP packet from input interface (Vlan2021) <-- Packet back to SVI from DHC

*Apr 16 14:37:46.000:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPACK, input interface: Vl2021

, MAC da: ffff.ffff.ffff, MAC sa: 0000.beef.cafe, IP da: 255.255.255.255, IP sa: 10.1.202.1, DHCP ciadd
*Apr 16 14:37:46.000: DHCP_SNOOPING: binary dump of option 82, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Apr 16 14:37:46.000: DHCP_SNOOPING: binary dump of extracted circuit id, length: 14 data:
0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0
*Apr 16 14:37:46.000: DHCP_SNOOPING: binary dump of extracted remote id, length: 10 data:
0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8 0x87 0x0
*Apr 16 14:37:46.001: actual_fmt_cid OPT82_FMT_CID_VXLAN_MOD_PORT_INTF global_opt82_fmt_rid OPT82_FMT_R
*Apr 16 14:37:46.001: dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan
*Apr 16 14:37:46.001:

DHCP_SNOOPING: opt82 data indicates not a local packet   <-- found this is coming from Leaf01 RID

*Apr 16 14:37:46.001: DHCP_SNOOPING: can't parse option 82 data of the message,it is either in wrong fo
*Apr 16 14:37:46.001: DHCP_SNOOPING: calling forward_dhcp_reply
*Apr 16 14:37:46.001: platform lookup dest vlan for input_if: Vlan2021, is NOT tunnel, if_output: Vlan2
*Apr 16 14:37:46.001: DHCP_SNOOPING: vlan 2021 after pvlan check
*Apr 16 14:37:46.011:

DHCP_SNOOPING: direct forward dhcp replyto output port: TwentyFiveGigE1/0/2. <-- Send to Firewall

<#root>

*Apr 16 14:37:46.011:

DHCP_SNOOPING: received new DHCP packet from input interface (TwentyFiveGigE1/0/1) <-- Coming back in f

*Apr 16 14:37:46.022:

DHCP_SNOOPING: process new DHCP packet, message type: DHCPACK, input interface: Twe1/0/1,

 MAC da: ffff.ffff.ffff, MAC sa: 0000.beef.cafe, IP da: 255.255.255.255, IP sa: 10.1.202.1, DHCP ciaddr
*Apr 16 14:37:46.022: DHCP_SNOOPING: binary dump of option 82, length: 26 data:
0x52 0x18 0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0 0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8
*Apr 16 14:37:46.022: DHCP_SNOOPING: binary dump of extracted circuit id, length: 14 data:
0x1 0xC 0x1 0xA 0x0 0x8 0x0 0x0 0x4E 0xE9 0x1 0x1 0x0 0x0
*Apr 16 14:37:46.022: DHCP_SNOOPING: binary dump of extracted remote id, length: 10 data:
0x2 0x8 0x0 0x6 0x68 0x2C 0x7B 0xF8 0x87 0x0
*Apr 16 14:37:46.022: actual_fmt_cid OPT82_FMT_CID_VXLAN_MOD_PORT_INTF global_opt82_fmt_rid OPT82_FMT_R
*Apr 16 14:37:46.022: dhcp_snooping_platform_is_local_dhcp_packet: VXLAN-MOD-PORT opt82 vni 20201, vlan
*Apr 16 14:37:46.022:

DHCP_SNOOPING: opt82 data indicates not a local packet

*Apr 16 14:37:46.022: DHCP_SNOOPING: EVPN enabled Ex GW:fabric relay can't parse option 82 data of the
*Apr 16 14:37:46.022: DHCP_SNOOPING: client address lookup failed to locate client interface, retry loo
*Apr 16 14:37:46.022: DHCP_SNOOPING: lookup packet destination port failed to get mat entry for mac: 00

```
*Apr 16 14:37:46.022: DHCP_SNOOPING: can't find client's destination port, packet is assumed to be not
*Apr 16 14:37:46.022: DHCP_SNOOPING: client address lookup failed to locate client interface, retry loo
*Apr 16 14:37:46.022: DHCP_SNOOPING: lookup packet destination port failed to get mat entry for mac: 00
*Apr 16 14:37:46.022:
```

DHCP_SNOOPING: L2RELAY: Ex GW unicast bridge packet to fabric: vlan id 202 from Twe1/0/1 <-- Send packe

嵌入式捕获

使用EPC确认DHCP数据包交换和参数正确

- 这从CGW的角度显示，但可以在枝叶上重复此过程以验证数据包交换
- 此示例显示Discover，因为其他DHCP数据包的流程和分析相同

检查到枝叶环回的路由

<#root>

CGW#

show ip route 172.16.254.3

```
Routing entry for 172.16.254.3/32
  Known via "ospf 1", distance 110, metric 3, type intra area
  Last update from 172.16.1.25 on TwentyFiveGigE1/0/47, 2w6d ago
  Routing Descriptor Blocks:
  * 172.16.1.29, from 172.16.255.3, 2w6d ago,
```

via TwentyFiveGigE1/0/48

```
      Route metric is 3, traffic share count is 1
    172.16.1.25, from 172.16.255.3, 2w6d ago,
```

via TwentyFiveGigE1/0/47

```
      Route metric is 3, traffic share count is 1
```

配置捕获以在面向Leaf01的链路上运行

```
monitor capture 1 interface TwentyFiveGigE1/0/47 BOTH
monitor capture 1 interface TwentyFiveGigE1/0/48 BOTH
monitor capture 1 match any
monitor capture 1 buffer size 100
monitor capture 1 limit pps 1000
```

开始捕获、触发主机请求DHCP IP地址以及停止捕获

<#root>

```
monitor capture 1 start
  (have the host request dhcp ip)
monitor capture 1 stop
```

查看从DHCP发现开始的捕获结果（注意事务ID以确认这是相同的DORA事件）

<#root>

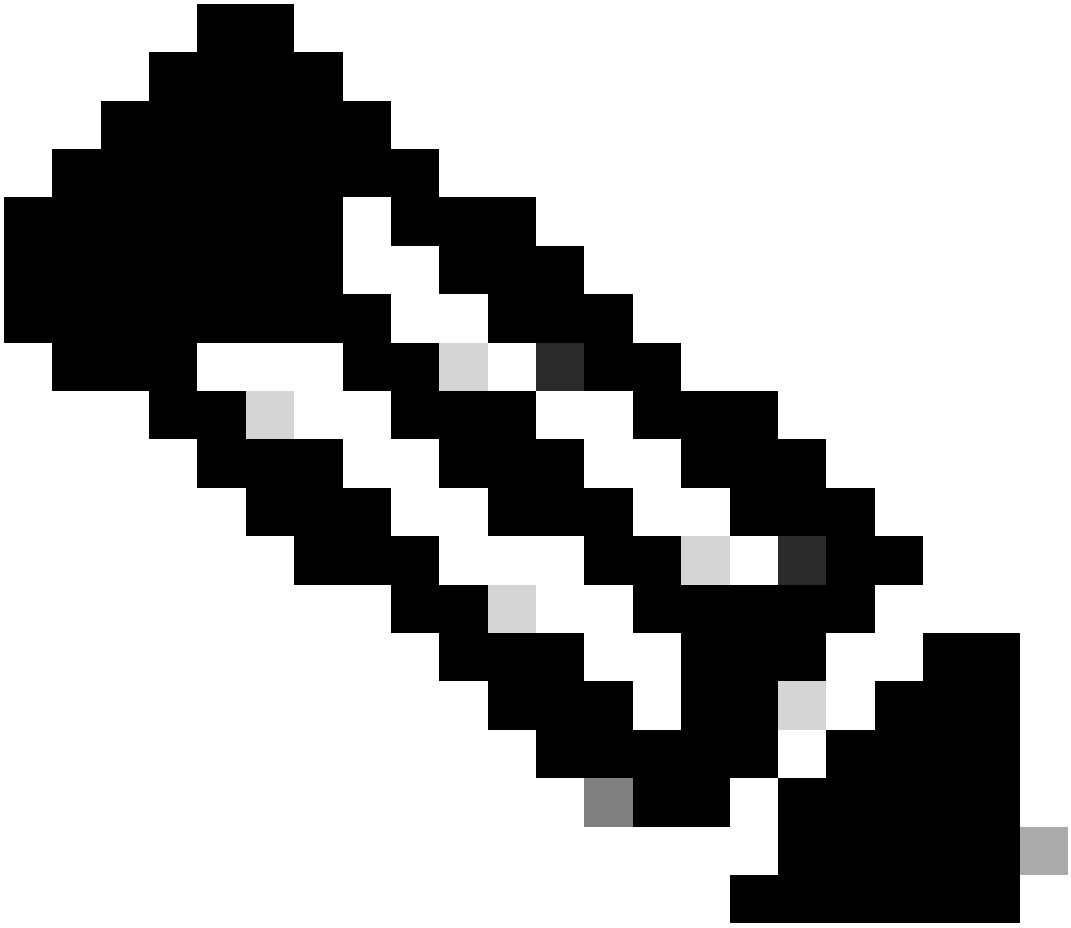
```
CGW#
show monitor cap 1 buff brief | i DHCP


 16
  12.737135      0.0.0.0 -> 255.255.255.255 DHCP 434
DHCP Discover
 -
Transaction ID 0x78b <-- Discover starts at Frame 16 with all same transaction ID
   18  14.740041   10.1.202.1 -> 255.255.255.255 DHCP 438 DHCP
Offer
    - Transaction ID
0x78b
   19  14.742741      0.0.0.0 -> 255.255.255.255 DHCP 452 DHCP
Request
  - Transaction ID
0x78b
   20  14.745646   10.1.202.1 -> 255.255.255.255 DHCP 438 DHCP
ACK
      - Transaction ID
0x78b
```

<#root>

```
CGW#
sh mon cap 1 buff detailed | b Frame 16
Frame 16:
 434 bytes on wire (3472 bits), 434 bytes captured (3472 bits) on interface /tmp/epc_ws/wif_to_ts_pipe,
    [Protocols in frame: eth:ethertype:ip:udp:vxlan:eth:ethertype:ip:udp:dhcp]
Ethernet II,
Src: dc:77:4c:8a:6d:7f
```

```
 (dc:77:4c:8a:6d:7f),

Dst: 10:f9:20:2e:9f:82

 (10:f9:20:2e:9f:82)

<-- Underlay Interface MACs

    Type: IPv4 (0x0800)
Internet Protocol Version 4,

Src: 172.16.254.3, Dst: 172.16.254.6

User Datagram Protocol, Src Port: 65281,

Dst Port: 4789                  <-- VXLAN Port

Virtual eXtensible Local Area Network
    VXLAN Network Identifier

(VNI): 20201                                <-- Correct VNI / Segment

    Reserved: 0
Ethernet II,

Src: 00:06:f6:01:cd:43

 (00:06:f6:01:cd:43),

Dst: 00:00:be:ef:ca:fe

 (00:00:be:ef:ca:fe)

<-- Inner Packet destined to CGW MAC


Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
User Datagram Protocol,

Src Port: 68, Dst Port: 67                      <-- DHCP ports


Dynamic Host Configuration Protocol (Discover)                          <-- DHCP Discover Packet


 Client MAC address: 00:06:f6:01:cd:43

 (00:06:f6:01:cd:43)
    Client hardware address padding: 00000000000000000000
    Server host name not given
    Boot file name not given
    Magic cookie: DHCP


 Option: (53) DHCP Message Type (Discover)

        Length: 1
        DHCP: Discover (1)
    Option: (57) Maximum DHCP Message Size
        Length: 2
        Maximum DHCP Message Size: 1152
    Option: (61) Client identifier
        Length: 27
        Type: 0
        Client Identifier: cisco-0006.f601.cd43-Vl202
    Option: (12) Host Name
```

```
        Length: 17


Host Name: 9300-HOST-3750X-2

    Option: (55) Parameter Request List
        Length: 8
        Parameter Request List Item: (1) Subnet Mask
        Parameter Request List Item: (6) Domain Name Server
        Parameter Request List Item: (15) Domain Name
        Parameter Request List Item: (44) NetBIOS over TCP/IP Name Server
        Parameter Request List Item: (3) Router
        Parameter Request List Item: (33) Static Route
        Parameter Request List Item: (150) TFTP Server Address
        Parameter Request List Item: (43) Vendor-Specific Information
    Option: (60) Vendor class identifier
        Length: 8
        Vendor class identifier: ciscopnp


Option: (82) Agent Information Option

        Length: 24
        Option 82 Suboption: (1) Agent Circuit ID
            Length: 12
            Agent Circuit ID: 010a000800004ee901010000


Option 82 Suboption: (2) Agent Remote ID

            Length: 8


Agent Remote ID:

000

6682c7bf88700  <-- switch base mac 682c.7bf8.8700 (from 'show switch')

    Option: (255) End
        Option End: 255
```



注意：可在任何枝叶或CGW上使用捕获工具来确定怀疑部分DHCP DORA交换失败的最后一个点。

验证监听统计错误

<#root>

```
Leaf01#

show ip dhcp snooping statistics detail

 Packets Processed by DHCP Snooping                  = 1288


Packets Dropped Because

   IDB not known                                     = 0
   Queue full                                        = 0
   Interface is in errdisabled                       = 0
   Rate limit exceeded                               = 0
   Received on untrusted ports                       = 0
```

```
   Nonzero giaddr                                  = 0
   Source mac not equal to chaddr                  = 0
   No binding entry                                = 0
   Insertion of opt82 fail                         = 0
   Unknown packet                                  = 0
   Interface Down                                  = 0
   Unknown output interface                        = 0
   Misdirected Packets                             = 0
   Packets with Invalid Size                       = 0
   Packets with Invalid Option                     = 0
```

<-- Look for any drop counter that is actively incrementing when the issue is seen.

验证DHCP监听的传送路径

- CoPP是丢弃传送路径中的数据包的主要组件

<#root>

Leaf01#

show platform hardware switch active qos queue stats internal cpu policer

```
                          CPU Queue Statistics
============================================================================================
                                          (default) (set)     Queue        Queue
QId
```

PlcIdx

```
  Queue Name                Enabled   Rate     Rate      Drop(Bytes)
```

Drop(Frames)

```
--------------------------------------------------------------------------------------------
17
```

6

DHCP Snooping

```
               Yes     400       400      0
```

0

```
              CPU Queue Policer Statistics
=============================================================================
```

Policer

```
    Policer Accept   Policer Accept  Policer Drop  Policer Drop
```

Index

```
         Bytes          Frames        Bytes          Frames
-----------------------------------------------------------------
```

```
6          472723           1288            0             0
```

用于定位可能发生数据包泛洪位置的另一个非常有用的命令是“show platform software fed switch active punt rates interfaces”

- 这对于查找发生泛洪的源接口非常有用，因为泛洪会使传送路径拥塞并影响合法的CPU绑定流量

<#root>

```
Leaf01#

show platform software fed switch active punt rates interfaces

Punt Rate on Interfaces Statistics

Packets per second averaged over 10 seconds, 1 min and 5 mins
================================================================================================
                              |           |  Recv |  Recv |  Recv |  Drop |  Drop  |  Drop
<-- Receive and drop rates for this port
 Interface Name               |  IF_ID    |  10s  |  1min |  5min |  10s  |  1min  |  5min
================================================================================================

GigabitEthernet1/0/1          0x0000000a

       2       2       2       0       0       0
<-- the port and its IF-ID which can be used in the next command


------------------------------------------------------------------------------------------------
```

<#root>

```
Leaf01#

show platform software fed switch active punt rates interfaces 0xa  <-- From previous command (omit the

Punt Rate on Single Interfaces Statistics

Interface : GigabitEthernet1/0/1 [if_id: 0xA]

  Received                        Dropped
  --------                        -------
   Total          : 8032546         Total           : 0
   10 sec average : 2               10 sec average  : 0
    1 min average : 2                1 min average  : 0
    5 min average : 2                5 min average  : 0

Per CPUQ punt stats on the interface

 (rate averaged over 10s interval)
```

```
================================================================================
 Q  |          Queue                  |  Recv   |  Recv  |  Drop  |  Drop  |
 no |          Name                   |  Total  |  Rate  |  Total |  Rate  |
================================================================================
 17

 CPU_Q_DHCP_SNOOPING

                 1216        0        0        0
<...snip...>
```

DHCP监听客户端统计信息

使用此命令观察DHCP消息交换。可以在枝叶或CGW上运行以查看事件跟踪

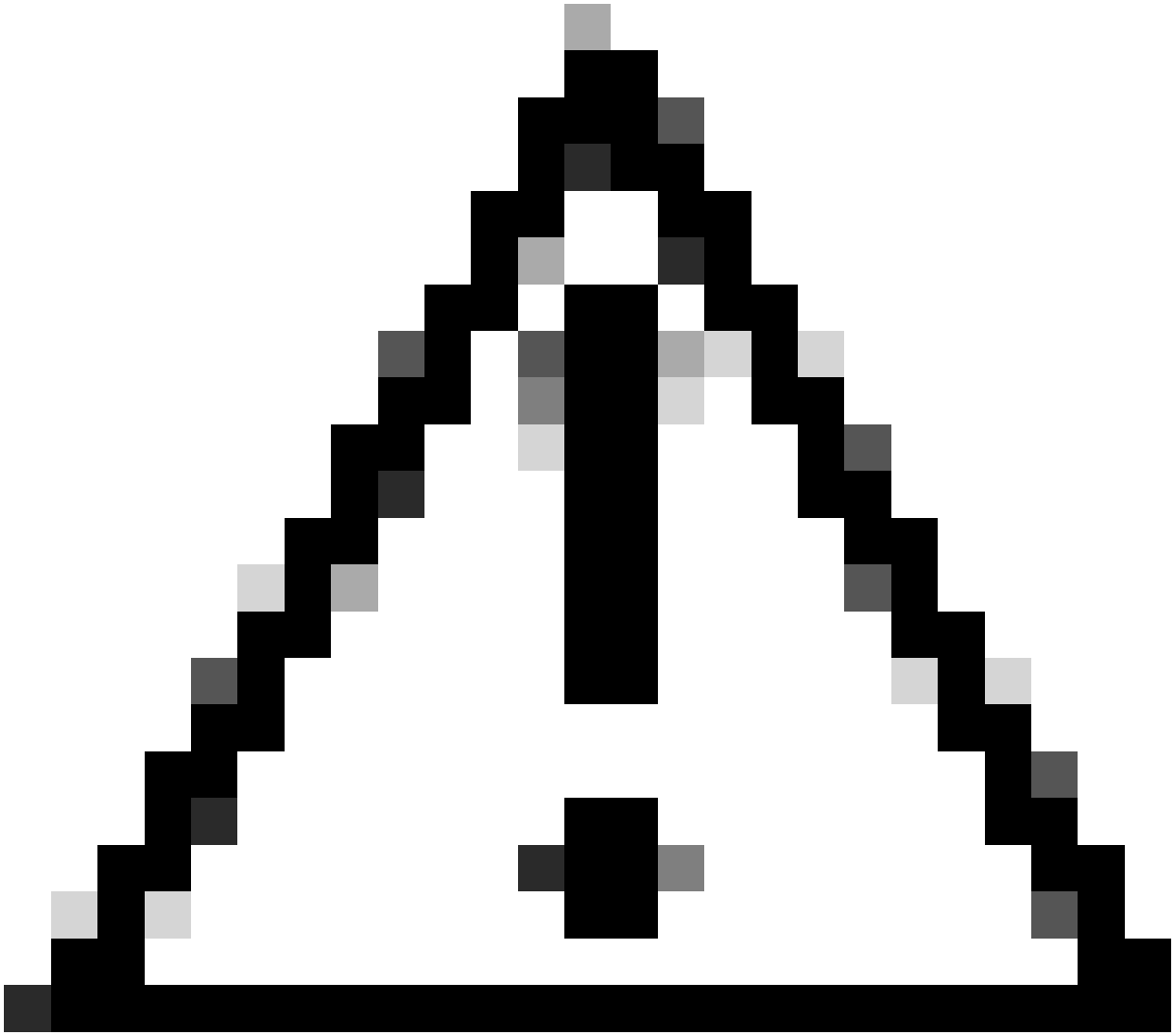
<#root>

```
Leaf01#

show platform dhcpsnooping client stats 0006.F601.CD43

DHCPSN: DHCP snooping server
DHCPD: DHCP protocol daemen
L2FWD: Transmit Packet to driver in L2 format
FWD: Transmit Packet to driver

(B): Dhcp message's response expected as 'B'roadcast
(U): Dhcp message's response expected as 'U'nicast

Packet Trace for client MAC 0006.F601.CD43:

Timestamp                Destination MAC  Destination Ip  VLAN  Message      Handler:Action
------------------------ ---------------- --------------- ----  ------------ ----------------
2023/09/28 14:53:59.866  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPDISCOVER(B) PUNT:RECEIVED
2023/09/28 14:53:59.866  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPDISCOVER(B) PUNT:TO_DHCPSN
2023/09/28 14:53:59.867  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPDISCOVER(B) BRIDGE:RECEIVED
2023/09/28 14:53:59.867  0000.BEEF.CAFE   255.255.255.255 202  DHCPDISCOVER(B) L2INJECT:TO_FWD
2023/09/28 14:53:59.867  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPDISCOVER(B) BRIDGE:TO_INJECT
2023/09/28 14:53:59.867  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPDISCOVER(B) L2INJECT:TO_FWD
2023/09/28 14:54:01.871  0006.F601.CD43   255.255.255.255 202  DHCPOFFER(B)    PUNT:RECEIVED
2023/09/28 14:54:01.871  0006.F601.CD43   255.255.255.255 202  DHCPOFFER(B)    PUNT:TO_DHCPSN
2023/09/28 14:54:01.874  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPREQUEST(B)  PUNT:RECEIVED
2023/09/28 14:54:01.874  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPREQUEST(B)  PUNT:TO_DHCPSN
2023/09/28 14:54:01.874  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPREQUEST(B)  BRIDGE:RECEIVED
2023/09/28 14:54:01.874  0000.BEEF.CAFE   255.255.255.255 202  DHCPREQUEST(B)  L2INJECT:TO_FWD
2023/09/28 14:54:01.874  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPREQUEST(B)  BRIDGE:TO_INJECT
2023/09/28 14:54:01.874  FFFF.FFFF.FFFF   255.255.255.255 202  DHCPREQUEST(B)  L2INJECT:TO_FWD
2023/09/28 14:54:01.877  0006.F601.CD43   255.255.255.255 202  DHCPACK(B)      PUNT:RECEIVED
2023/09/28 14:54:01.877  0006.F601.CD43   255.255.255.255 202  DHCPACK(B)      PUNT:TO_DHCPSN
```

其他调试

```
debug ip dhcp server packet detail
debug ip dhcp server packet
```

```
debug ip dhcp server events
debug ip dhcp snooping packet
debug dhcp detail
```



警告：运行调试时务必小心！

相关信息

- 在Catalyst 9000系列交换机上实施BGP EVPN路由策略
- 在Catalyst 9000系列交换机上实施BGP EVPN保护的重叠分段
- 运行Catalyst 9000交换机上的DHCP监听并对其进行故障排除

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