

ACI远程枝叶发现和配置

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简介

本文档介绍使用应用策略基础设施控制器(APIC)GUI在现有以应用为中心的基础设施(ACI)交换矩阵中发现和配置远程枝叶(RLEAF)的步骤。

背景信息

ACI远程枝叶交换机部署可帮助客户将ACI交换矩阵 (ACI服务和APIC管理) 扩展到没有连接本地主干交换机或APIC的远程数据中心。 远程枝叶交换机通过广域网(WAN)添加到交换矩阵中的现有Pod。在主数据中心部署的所有策略都部署在远程交换机中，其行为类似于属于交换矩阵的本地枝叶交换机。在远程枝叶拓扑中，所有单播流量通过第3层通过VXLAN传输。第2层广播、未知单播和组播(BUM)流量与头端复制(HER)隧道一起发送，而不使用组播。远程站点上的所有本地流量在终端之间直接交换，无论是物理的还是虚拟的。任何需要使用主干代理的流量都会转发到主交换矩阵

。与本地枝叶一样，远程枝叶可用于连接虚拟服务器、物理服务器和容器。连接到远程枝叶的终端的流量通过远程枝叶交换机进行本地转发。

先决条件

要求

Cisco 建议您了解以下主题：

- ACI交换矩阵
- ACI GUI
- ACI枝叶和主干交换机CLI
- NXoS交换机CLI

使用的组件

本文档中的信息基于以下软件和硬件版本：

- APIC版本3.1(2q)
- 主干LC N9K-X9732C-EX
- 枝叶N9K-X9732C-EX
- IP网络(IPN)- Nexus 7000,N7K-SUP2E , N7K-F348XP-25

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

ACI 3.1(1)版本支持远程枝叶解决方案。下表列出了截至本文编写之日支持远程枝叶解决方案的硬件列表。

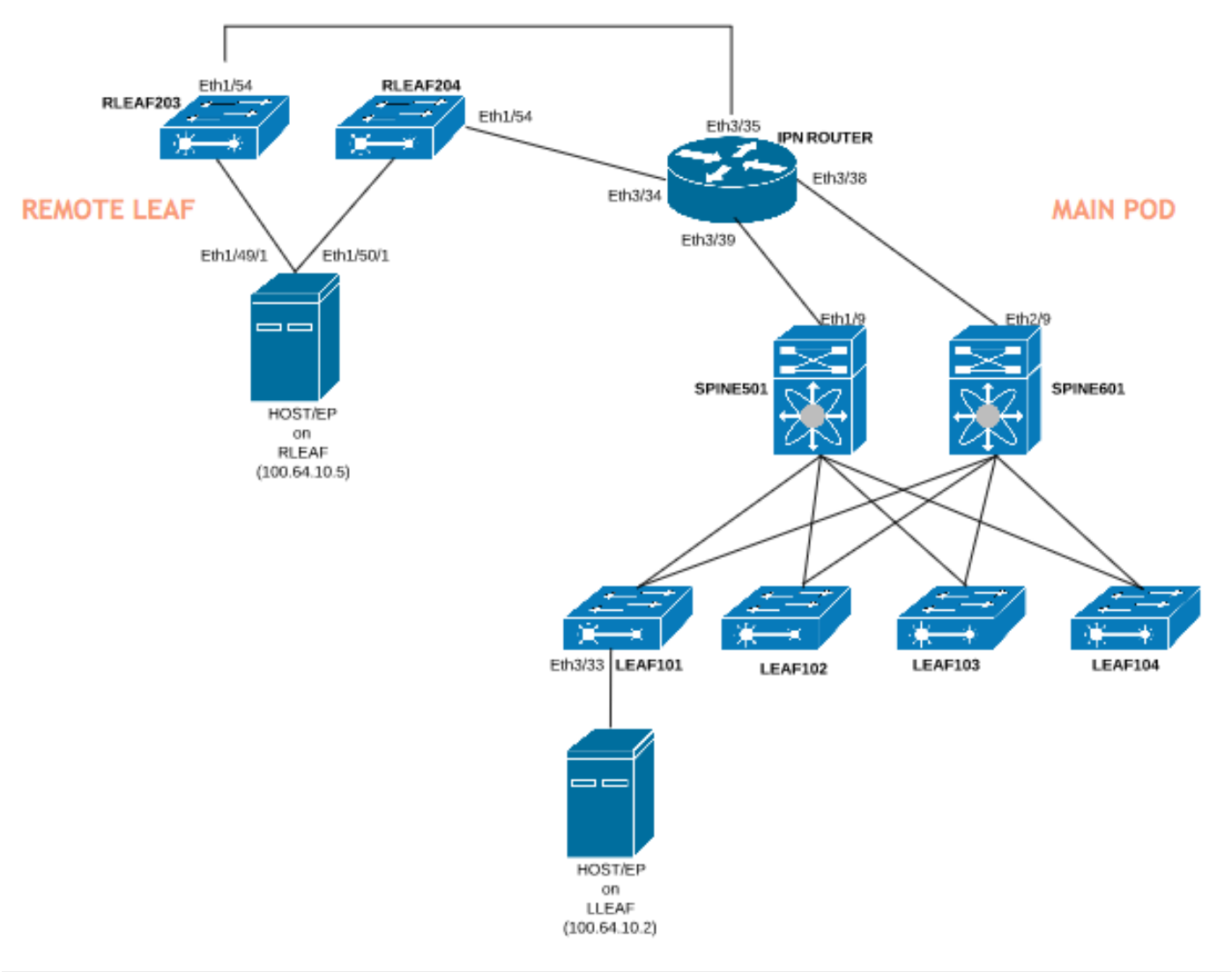
主干/枝叶	型号
固定主干	N9364C
模块化主干LC	N9732C-EX N9736C-FX
枝叶	N93180YC-EX 93180YC-FX N93108TC-EX

	93108TC-FX
	N93180LC-EX
	N9348GC-FXP
	N9336C-FX2

配置

网络图

此网络图描述了本示例中使用的拓扑。



配置

本文档主要介绍用于远程枝叶部署的配置的ACI端，但不涉及IPN交换机的WAN端配置的全部详细信息。但是，此处列出了一些来自IPN的重要配置以供参考。

远程广域网配置 (ACI主交换矩阵端)

以下是在连接到主交换矩阵中的ACI主干的IPN设备中使用的配置：

```
vrf context RLEAF
  description VRF created for remote-leaf lab

router ospf 1

  vrf RLEAF
    router-id 172.16.191.191
    area 0.0.0.1 nssa

# In this example same IPN router is used to connect to RLEAF and SPINE

interface loopback191
  vrf member RLEAF
  ip address 172.16.191.191/32
```

连接到主干的IPN上的接口特定配置。

朝向主干-601	朝向主干-501
interface Ethernet3/38 mtu 9150 no shutdown interface Ethernet3/38.4 spine601的描述链接 mtu 9150 encapsulation dot1Q 4 vrf成员RLEAF ip address 10.10.19.10/24 ip ospf network point-to-point	以太网接口3/39 mtu 9150 no shutdown interface Ethernet3/39.4 spine501的说明链接 mtu 9150 encapsulation dot1Q 4 vrf成员RLEAF ip address 10.10.20.10/24 ip ospf network point-to-point

ip router ospf 1 area 0.0.0.1 no shutdown	ip router ospf 1 area 0.0.0.1 no shutdown
--	--

远程WAN配置 (RLEAF端)

以下是连接到远程枝叶的IPN设备中使用的配置：

vrf情景RLEAF 说明为远程枝叶实验创建的VRF router ospf 1 vrf RLEAF router-id 172.16.191.191 area 0.0.0.1 nssa #在本示例中，使用同一IPN路由器连接到RLEAF和SPINE interface loopback191 vrf成员RLEAF ip address 172.16.191.191/32
--

连接到RLEAF的IPN上的接口特定配置：

朝RLEAF-204	朝RLEAF-203
interface Ethernet3/34 mtu 9150 no shutdown interface Ethernet3/34.4 指向rleaf204的说明链接 mtu 915 encapsulation dot1Q 4 ip access-group 100 in vrf成员RLEAF	以太网接口3/35 mtu 9150 no shutdown interface Ethernet3/35.4 指向rleaf203的说明链接 mtu 9150 encapsulation dot1Q 4 ip access-group 100 in vrf成员RLEAF

ip address 10.10.21.10/24	ip address 10.10.22.10/24
ip ospf network point-to-point	ip ospf network point-to-point
ip router ospf 1 area 0.0.0.1	ip router ospf 1 area 0.0.0.1
ip dhcp relay address 10.0.0.1	ip dhcp relay address 10.0.0.1
ip dhcp relay address 10.0.0.2	ip dhcp relay address 10.0.0.2
ip dhcp relay address 10.0.0.3	ip dhcp relay address 10.0.0.3
no shutdown	no shutdown

 注：确保dhcp-relay IP在连接到远程枝叶的接口下配置了APIC交换矩阵IP地址。这是远程枝叶从APIC获取引导程序文件所必需的。在本示例中，10.0.0.1、10.0.0.2、10.0.0.3是APIC TEP IP地址。远程枝叶向WAN发送DHCP DISCOVER，以获取连接到WAN路由器的子接口的IP地址。WAN路由器将DHCP DISCOVER消息从远程枝叶中继到POD中的APIC。

ACI配置步骤1.配置Pod交换矩阵设置策略

- 1.导航至交换矩阵>资产> Pod交换矩阵设置策略。
- 2.双击打开现有Pod的交换矩阵设置策略。
- 3.添加(+)远程池，提供远程ID（在本例中为11）和远程池(在本例中为172.17.0.0/20)，然后点击提交。图像片段可以显示不同的IP编址方案。

 注意：远程枝叶TEP池子网不得与主交换矩阵TEP池子网重叠。使用的子网必须是/24或更低。

Inventory | Fabric Policies | Access Policies

Inventory

- Quick Start
- Topology
- Pod 1
 - Pod Fabric Setup Policy
 - Fabric Membership
 - Unmanaged Fabric Node
 - Unreachable Nodes
 - Disabled Interfaces and...

Pod Fabric Setup Policy

Pod ID	TEP Pool	Remote ID
1	10.0.0.0/16	11

Fabric Setup Policy For A POD - Pod 1

Policy | Faults | History

Properties

ID: 1

TEP Pool: 10.0.0.0/16

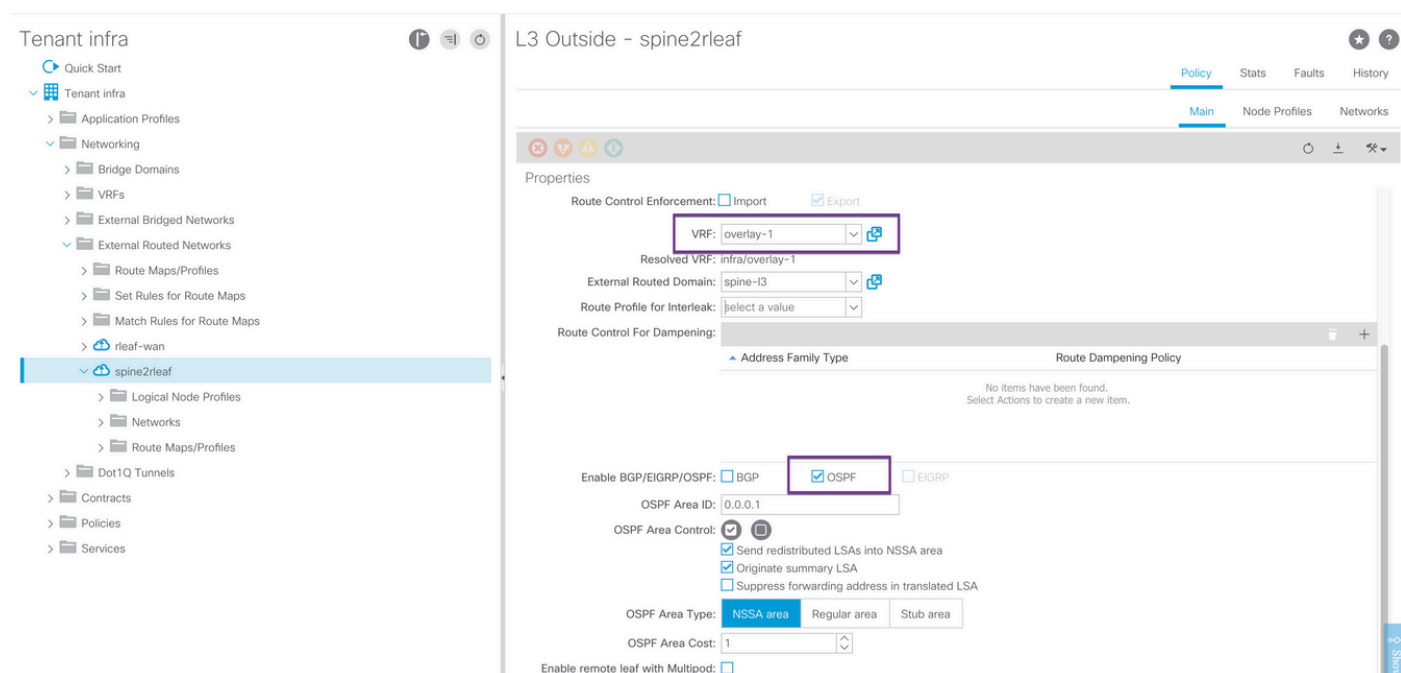
Remote Pools:

Remote ID	Remote Pool
11	11.0.0.0/20

ACI配置步骤2.配置从主干路由到IPN的外部路由

- 1.导航至“租户”>“基础设施”>“外部路由网络”。
- 2.右键单击并创建Routed Outside。
- 3.配置脊柱到IPN的OSPF外部路由。
- 4.使用OSPF作为路由协议。
- 5.使用overlay-1作为VRF。

在本示例中，远程枝叶连接到单个Pod交换矩阵。因此，未选择“Enable remote leaf with Multipod”。如果您将远程枝叶与Multipod交换矩阵一起使用，则必须选中此选项。



为连接到IPN的每个主干（在本示例中为node-501和node-601）配置节点配置文件。此处显示节点-501的示例。对node-601执行相同的步骤。图像片段可以显示不同的IP编址方案。

Tenant infra

- Bridge Domains
- VRFs
- External Bridged Networks
- External Routed Networks
 - Route Maps/Profiles
 - Set Rules for Route Maps
 - Match Rules for Route Maps
 - leaf-wan
 - spine2rleaf
 - Logical Node Profiles
 - spine501
 - Logical Interface Profiles
 - spine501
 - Configured Nodes
 - topology/pod-1/node-501
 - spine601
 - Logical Interface Profiles
 - spine601
 - Configured Nodes
 - topology/pod-1/node-601
 - Networks
 - leaf
 - Route Maps/Profiles

Node Association

Policy Faults History

Properties

Node ID: topology/pod-1/node-501
Router ID: 50.50.50.50

Use Router ID as Loopback Address: ☒ This setting will be ignored if loopback addresses are defined in the table below.

Loopback Addresses:

IP
No items have been found. Select Actions to create a new item.

Static Routes:

IP Address	Next Hop IP
No items have been found. Select Actions to create a new item.	

External Control Peering: ☒

Page 0 Of 0 Objects Per Page: 15 No Objects Found

为IPN连接配置接口配置文件。

 注意：确保使用encap vlan-4与单个Pod进行远程枝叶集成。

路径501/pathep-[eth1/9]的示例。

Tenant infra

- Quick Start
- Tenant infra
 - Application Profiles
 - Networking
 - Bridge Domains
 - VRFs
 - External Bridged Networks
 - External Routed Networks
 - Route Maps/Profiles
 - Set Rules for Route Maps
 - Match Rules for Route Maps
 - leaf-wan
 - spine2rleaf
 - Logical Node Profiles
 - spine501
 - Logical Interface Profiles
 - spine501
 - Configured Nodes
 - spine501
 - spine601
 - Logical Interface Profiles
 - spine601
 - Configured Nodes
 - spine601
 - Networks
 - Dot1Q Tunnels
 - Contracts

Logical Interface Profile - spine501

Policy Faults History

SVI

Routed Sub-Interface

Properties

Target: topology/pod-1/paths-501/pathep-[eth1/9]

Description: optional

Encap: VLAN 4

IPv4 Primary / IPv6 Preferred Address: 10.10.20.11/24

IPv6 DAD: disabled enabled

IPv4 Secondary / IPv6 Additional Addresses:

Address	IPv6 DAD
No items have been found. Select Actions to create a new item.	

Link-Local Address: ::

ND RA Prefix: ☐

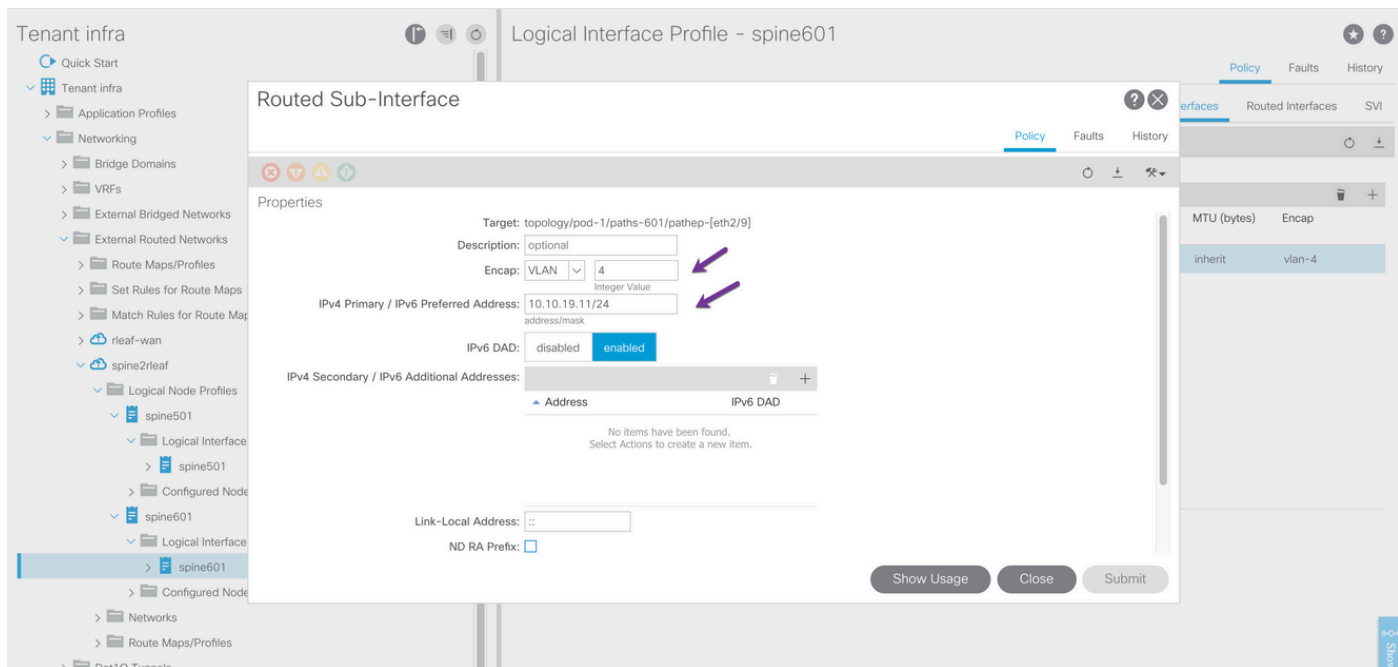
MAC Address: 00:22:BD:F8:19:FF

MTU (bytes): inherit

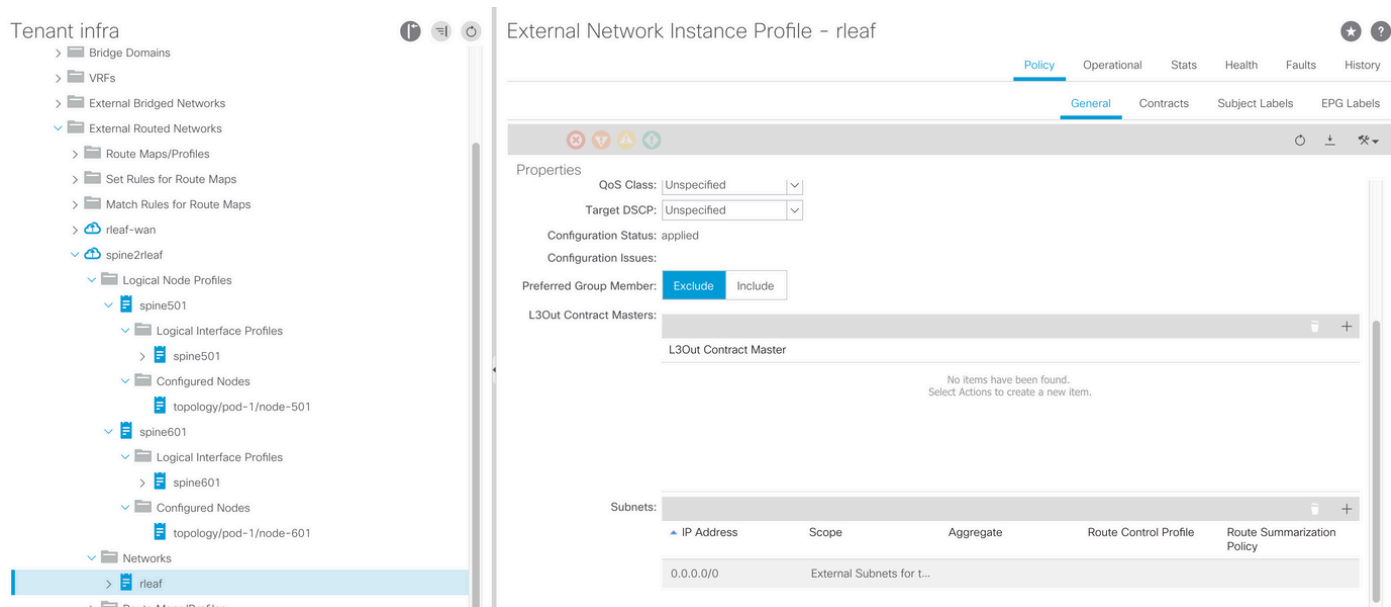
Target DSCP: Unspecified

Show Usage Close Submit

路径601/pathep-[eth2/9]的示例。



为IPN配置L3Out网络（外部EPG）。



现在您已将OSPF L3Out从主干（节点501和节点601）配置到IPN设备。如果IPN上的OSPF配置正确，则OSPF邻接关系应处于启用状态且路由已交换。因此，请检查从脊柱到IPN设备的OSPF邻居关系。

从主干：

```
spine501# show ip ospf neighbors vrf overlay-1
OSPF Process ID default VRF overlay-1
Total number of neighbors: 1
Neighbor ID    Pri State           Up Time  Address      Interface
172.16.191.191 1 FULL/-          00:00:36 10.10.20.10  Eth1/9.9
spine501#
```

```

spine601# show ip ospf neighbors vrf overlay-1
OSPF Process ID default VRF overlay-1
Total number of neighbors: 1
Neighbor ID      Pri State                Up Time  Address      Interface
172.16.191.191   1 FULL/ -              00:00:39  10.10.19.10  Eth2/9.9
spine601#

```

从IPN:

```

SPINE-IPN# show ip ospf neighbors vrf RLEAF
OSPF Process ID 1 VRF RLEAF
Total number of neighbors: 2
Neighbor ID      Pri State                Up Time  Address      Interface
172.16.60.60     1 FULL/ -              00:00:06  10.10.19.11  Eth3/38.4
172.16.50.50     1 FULL/ -              00:00:17  10.10.20.11  Eth3/39.4
SPINE-IPN#

```

现在，您在主干和IPN之间具有OSPF邻居关系，您可以看到到ACI交换矩阵Pod基础设施网络的路由是通过OSPF在IPN中学习的。

```

SPINE-IPN# show ip route vrf RLEAF
IP Route Table for VRF "RLEAF"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
 '%' in via output denotes VRF

10.0.0.0/16, ubest/mbest: 2/0
    *via 10.10.19.11, Eth3/38.4, [110/20], 00:01:21, ospf-1, nssa type-2
    *via 10.10.20.11, Eth3/39.4, [110/20], 00:01:21, ospf-1, nssa type-2
< snip >
SPINE-IPN#

```

ACI配置步骤3.发现远程枝叶

在此阶段，交换矩阵已准备好通过WAN发现连接到IPN的远程枝叶。确保连接到RLEAF的IPN具有通过WAN网络到达ACI Pod基础设施网络的路由。

<#root>

RLEAF-IPN#

show lldp neighbors

Capability codes:

```

(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
Device ID          Local Intf      Hold-time  Capability  Port ID
switch             Eth3/34        120       BR          Eth1/54
switch             Eth3/35        120       BR          Eth1/54
Total entries displayed: 2
RLEAF-IPN#

```

RLEAF-IPN#

show ip route vrf RLEAF

```

IP Route Table for VRF "RLEAF"
'*' denotes best ucast next-hop
'***' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

10.0.0.0/16, ubest/mbest: 2/0
    *via 10.10.19.11, Eth3/38.4, [110/20], 00:01:21, ospf-1, nssa type-2
    *via 10.10.20.11, Eth3/39.4, [110/20], 00:01:21, ospf-1, nssa type-2

< snip >

```

检查连接到远程枝叶的IPN，确保APIC交换矩阵IP地址配置为DHCP中继。

<#root>

RLEAF-IPN#

show ip dhcp relay

< snip >

Helper addresses are configured on the following interfaces:

Interface	Relay Address	VRF Name
-----	-----	-----
Ethernet3/34.4	10.0.0.1	
Ethernet3/34.4	10.0.0.2	
Ethernet3/34.4	10.0.0.3	
Ethernet3/35.4	10.0.0.1	
Ethernet3/35.4	10.0.0.2	
Ethernet3/35.4	10.0.0.3	

RLEAF-IPN#

在ACI GUI中导航到资产(Inventory)>交换矩阵成员(Fabric Membership)，并检查是否发现了新交换机。

Inventory

Quick Start

Topology

Pod 1

leaf101 (Node-101)

leaf102 (Node-102)

leaf103 (Node-103)

leaf104 (Node-104)

leaf201 (Node-201)

leaf202 (Node-202)

spine501 (Node-501)

spine601 (Node-601)

Pod Fabric Setup Policy

Fabric Membership

Unmanaged Fabric Nodes

Unreachable Nodes

Disabled Interfaces and Decommissioned Switches

Fabric Membership

Serial Number	Pod ID	Node ID	RL TEP Pool	Node Name	Rack Name	Model	Role	IP	Support Model	SSL Certifi	Status
FDO20331BFQ	1	202	0	leaf202		N9K-C93180YC-EX	leaf	10.0.232.68/32	True	yes	Active
FDO21031WXP	1	201	0	leaf201		N9K-C93108TC-FX	leaf	10.0.232.72/32	True	yes	Active
FDO220810B0	1	0	0			N9K-C93180YC-EX	leaf	0.0.0.0	True	n/a	
FOX1948G9EA	1	601	0	spine601		N9K-C9504	spine	10.0.232.65/32	True	yes	Active
FOX1949GHHM	1	501	0	spine501		N9K-C9504	spine	10.0.232.66/32	True	yes	Active
SAL1946SWJM	1	101	0	leaf101		N9K-C9372PX-E	leaf	10.0.232.64/32	True	yes	Active
SAL1946SWNS	1	102	0	leaf102		N9K-C9372PX-E	leaf	10.0.232.73/32	True	yes	Active
SAL1946SWNT	1	104	0	leaf104		N9K-C9372PX-E	leaf	10.0.8.64/32	True	yes	Active
SAL1946SWNU	1	103	0	leaf103		N9K-C9372PX-E	leaf	10.0.232.69/32	True	yes	Active
FDO22080JDA	1	0	0			N9K-C93180YC-EX	leaf	0.0.0.0	True	n/a	

将新发现的枝叶注册到现有交换矩阵：

- 1.根据序列号识别新的枝叶。
- 2.右键单击新发现的枝叶，然后单击Register。
- 3.提供正确的Pod ID和节点ID。
- 4.选择RL TEP POOL。
- 5.提供节点名称。
- 6.检查并确认已选择Role作为远程枝叶。
- 7.单击更新。

Serial Number	Pod ID	Node ID	RL TEP Pool	Node Name	Rack Name	Model	Role	IP	Support Model	SSL Certifi	Status
FDO22080JDA	1	203	11	leaf203	select	N9K-C93180YC-EX	leaf	0.0.0.0	True	n/a	
FDO220810B0	1	204	11	leaf204	select	N9K-C93180YC-EX	leaf	0.0.0.0	True	n/a	
FOX1948G9EA	1	601	0	spine601			spine	10.0.232.65/32	True	yes	Active

Update Cancel

 注：请确保选择在步骤1中配置的正确RL TEP池。此外，从下拉列表中选择RL TEP POOL时，请选中并确认已自动选择Role作为远程枝叶。

现在，您可以看到节点类型标识为“远程枝叶”，状态标识为“发现”。该节点尚未获得交换矩阵IP地址。

Inventory

Quick Start

Topology

Pod 1

leaf101 (Node-101)

leaf102 (Node-102)

leaf103 (Node-103)

leaf104 (Node-104)

leaf201 (Node-201)

leaf202 (Node-202)

spine501 (Node-501)

spine601 (Node-601)

Pod Fabric Setup Policy

Fabric Membership

Unmanaged Fabric Nodes

Unreachable Nodes

Disabled Interfaces and Decommissioned Switches

Fabric Membership

Serial Number	Pod ID	Node ID	RL TEP Pool	Node Name	Rack Name	Model	Role	IP	Support Model	SSL Certif	Status
FDO20331BFQ	1	202	0	leaf202		N9K-C93180YC-EX	leaf	10.0.232.68/32	True	yes	Active
FDO21031WXP	1	201	0	leaf201		N9K-C93108TC-FX	leaf	10.0.232.72/32	True	yes	Active
FDO22080JDA	1	203	11	rleaf203		N9K-C93180YC-EX	remote leaf	0.0.0.0	True	yes	Discovering
FDO220810B0	1	204	11	rleaf204		N9K-C93180YC-EX	remote leaf	0.0.0.0	True	yes	Discovering
FOX1948G9EA	1	601	0	spine601		N9K-C9504	spine	10.0.232.65/32	True	yes	Active
FOX1949GHMM	1	501	0	spine501		N9K-C9504	spine	10.0.232.66/32	True	yes	Active
SAL1946SWJM	1	101	0	leaf101		N9K-C9372PX-E	leaf	10.0.232.64/32	True	yes	Active
SAL1946SWNS	1	102	0	leaf102		N9K-C9372PX-E	leaf	10.0.232.73/32	True	yes	Active
SAL1946SWNT	1	104	0	leaf104		N9K-C9372PX-E	leaf	10.0.8.64/32	True	yes	Active
SAL1946SWNU	1	103	0	leaf103		N9K-C9372PX-E	leaf	10.0.232.69/32	True	yes	Active

ACI配置步骤4.配置从RLEAF到IPN的路由出站

1.定位至“租户”>“基础设施”>“外部路由网络”，然后创建“外部路由”。

Create Routed Outside

STEP 1 > Identity

Define the Routed Outside

Description: optional

Tags: enter tags separated by comma

PIM: ☐

Route Control Enforcement: ☐ Import ☒ Export

Target DSCP: Unspecified

VRF: overlay-1

External Routed Domain: rleaf-l3

Route Profile for Interleaf: select a value

Route Control For Dampening:

Address Family Type

Route Dampening Policy

Address Family Type

Consumer Label: enter names separated by comma

☐ BGP ☐ EIGRP ☒ OSPF

OSPF Area ID: 1

OSPF Area ☒ ☐

Control: ☒ Send redistributed LSAs into NSSA area ☒ Originate summary LSA ☐ Suppress forwarding address in translated LSA

OSPF Area Type: NSSA area Regular area Stub area

OSPF Area Cost: 1

Enable Remote Leaf: ☐

Nodes and Interfaces Protocol Profiles

Name	Description	DSCP	Nodes
rleaf-node-profile		Unspecified	203, 204

Previous

Cancel

Next

2.为节点203和204创建RLEAF节点配置文件。

现在，您可以从Node ID下拉列表中选择rleaf-203(Node-203)和rleaf-204(Node-204)，因为它们现在已在交换矩阵中发现。

RLEAF 203节点配置文件：

Create Routed Outside

Select Node

Select Node and Configure Static Routes

Node ID: rleaf203 (Node-203)

Router ID: 203.203.203.203

Use Router ID as Loopback Address: ☒

External Control Peering: ☒

Loopback Addresses:

IP

Static Routes:

IP Address

Next Hop IP

Cancel

OK

RLEAF 204节点配置文件：

Create Routed Outside

Select Node

Select Node and Configure Static Routes

Node ID: rleaf204 (Node-204)

Router ID: 204.204.204.204

Use Router ID as Loopback Address: ☒

External Control Peering: ☒

Loopback Addresses:

IP

Static Routes:

IP Address

Next Hop IP

Cancel

OK

为节点203和节点204创建RLEAF接口配置文件：

 注：由于RLEAF203或RLEAF204未注册，因此不能从Node下拉列表中看到Noderleaf-203(Node-203)或rleaf-204(Node-204)。因此，请在节点和路径字段中手动输入路径，如图所示。

为node-203创建接口配置文件。手动输入节点和路径字段，如下所示。

Node: topology/pod-1/node-203

Path: topology/pod-1/paths-203/pathep-[eth1/54]

Select Routed Sub-Interface



Specify the Interface

Node: topology/pod-1/node-203

Ex: topology/pod-1/node-1

Path: topology/pod-1/paths-203/pathep-[eth

Ex: topology/pod-1/paths-101/pathep-[eth1/23]

Description: optional

Encap: VLAN

4

Integer Value

IPv4 Primary / IPv6 Preferred Address:

10.10.22.11/24

address/mask

IPv6 DAD:

disabled

enabled

IPv4 Secondary / IPv6 Additional

Addresses:

Address

IPv6 DAD

MAC Address:

00:22:BD:F8:19:FF

MTU (bytes):

inherit

Link-local Address:

Cancel

OK

为node-204创建接口配置文件。手动输入节点和路径字段，如下所示。

Node: topology/pod-1/node-204

Path: topology/pod-1/paths-204/pathep-[eth1/54]

Select Routed Sub-Interface



Specify the Interface

Node: topology/pod-1/node-203

Ex: topology/pod-1/node-1

Path: topology/pod-1/paths-203/pathsep-[eth

Ex: topology/pod-1/paths-101/pathsep-[eth1/23]

Description: optional

Encap: VLAN 4
Integer ValueIPv4 Primary / IPv6 Preferred Address: 10.10.22.11/24
address/maskIPv6 DAD: disabled **enabled**IPv4 Secondary / IPv6 Additional
Addresses:

Address

IPv6 DAD

MAC Address: 00:22:BD:F8:19:FF

MTU (bytes): inherit

Link-local Address:

Cancel

OK

创建L3Out外部网络（外部EPG）：

Create Routed Outside



[STEP 2 > External EPG Networks](#)

Configure External EPG Networks

Create Route
Profiles: ☐

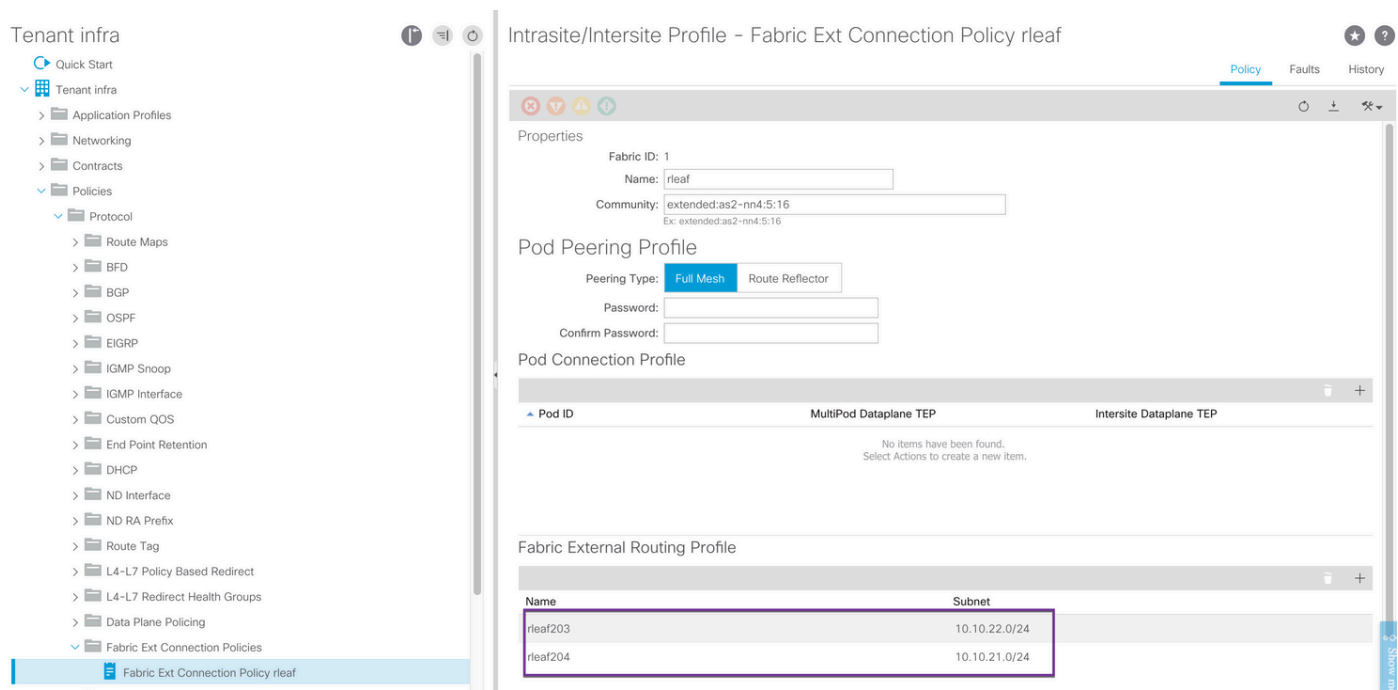
External EPG Networks

Name	QoS Class	Description	Target DSCP	Subnet
rieaf-l3out	Unspecified		Unspecified	0.0.0.0/0

ACI配置步骤5.创建交换矩阵外部连接策略

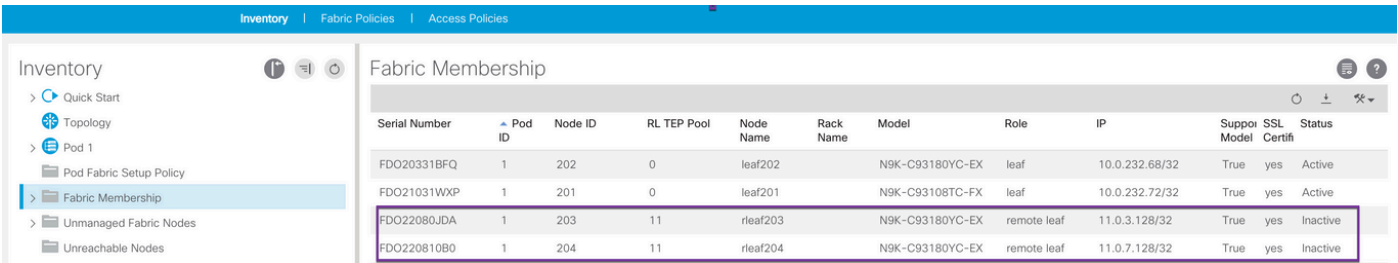
1.导航到租户>基础设施>策略>协议>交换矩阵扩展连接策略>交换矩阵外部连接策略，并创建站内/站间配置文件。

- 2.添加交换矩阵外部路由配置文件，将外部网络RLEAF203和RLEAF204连接到WAN路由器(IPN)。
- 3.在本例中，这些地址分别为10.10.22.0/24和10.10.21.0/24。

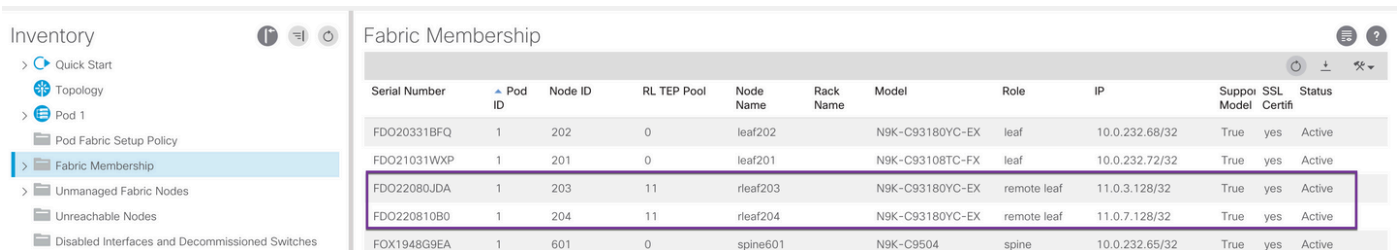


ACI配置步骤6.将远程枝叶注册到ACI交换矩阵Pod

然后，远程枝叶从APIC TEP池获取交换矩阵IP地址。



请等待一段时间，以使远程枝叶进入活动状态。现在，您可以看到远程枝叶rleaf-203和rleaf-204已注册到ACI交换矩阵。



<#root>

apic3#

acidiag fmvread

ID	Pod ID	Name	Serial Number	IP Address	Role	State	LastU
101	1	leaf101	SAL1946SWJM	10.0.232.64/32	leaf	active	0
102	1	leaf102	SAL1946SWNS	10.0.232.73/32	leaf	active	0
103	1	leaf103	SAL1946SWNU	10.0.232.69/32	leaf	active	0
104	1	leaf104	SAL1946SWNT	10.0.8.64/32	leaf	active	0
201	1	leaf201	FD021031WXP	10.0.232.72/32	leaf	active	0
202	1	leaf202	FD020331BFQ	10.0.232.68/32	leaf	active	0
203	1	rleaf203	FD022080JDA	172.17.3.128/32	leaf	active	0
204	1	rleaf204	FD0220810B0	172.17.7.128/32	leaf	active	0
501	1	spine501	FOX1949GHM	10.0.232.66/32	spine	active	0
601	1	spine601	FOX1948G9EA	10.0.232.65/32	spine	active	0

Total 10 nodes

apic3#

现在，您可以看到远程枝叶和IPN之间的OSPF邻居关系。

从RLEAF 203:

<#root>

rleaf203#

show ip ospf neighbors vrf overlay-1

OSPF Process ID default VRF overlay-1
Total number of neighbors: 1
Neighbor ID Pri State Up Time Address Interface
172.16.191.191 1 FULL/ - 00:24:57 10.10.22.10 Eth1/54.6
rleaf203#

rleaf203#

show ip route vrf overlay-1

IP Route Table for VRF "overlay-1"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

10.0.0.0/16, ubest/mbest: 1/0

```

    *via 10.10.22.10, eth1/54.6, [110/20], 00:30:24, ospf-default, nssa type-2
10.0.0.1/32, ubest/mbest: 1/0
    *via 10.10.22.10, eth1/54.6, [110/20], 00:30:24, ospf-default, nssa type-2

< snip >

```

从RLEAF 204:

```

<#root>

rleaf204#

show ip ospf neighbors vrf overlay-1

 OSPF Process ID default VRF overlay-1
Total number of neighbors: 1
Neighbor ID      Pri State                Up Time  Address      Interface
172.16.191.191   1 FULL/ -              00:25:36  10.10.21.10  Eth1/54.6
rleaf204#

rleaf204#

show ip route vrf overlay-1

```

```

IP Route Table for VRF "overlay-1"
'<' denotes best ucast next-hop
'>' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

10.0.0.0/16, ubest/mbest: 1/0
    *via 10.10.21.10, eth1/54.6, [110/20], 00:31:37, ospf-default, nssa type-2
10.0.0.1/32, ubest/mbest: 1/0
    *via 10.10.21.10, eth1/54.6, [110/20], 00:31:37, ospf-default, nssa type-2

< snip >

```

从IPN:

```

<#root>

RLEAF-IPN#

show ip ospf neighbors vrf RLEAF

 OSPF Process ID 1 VRF RLEAF
Total number of neighbors: 4
Neighbor ID      Pri State                Up Time  Address      Interface
172.16.204.204   1 FULL/ -              00:26:03  10.10.21.11  Eth3/34.4
172.16.203.203   1 FULL/ -              00:26:03  10.10.22.11  Eth3/35.4
RLEAF-IPN#

```

ACI配置步骤7.远程枝叶的QoS配置

需要将ACI交换矩阵类 (QoS级别) 分类为IPN内的DSCP值。要达到此要求，应使用L3流量的DSCP class-cos转换策略启用ACI交换矩阵。使用此配置将ACI QOS级别和默认类映射到IPN中的DSCP值。

导航到租户(Tenant)>基础设施(Infra)>策略(Policies)> L3流量的DSCP class-cos转换策略(DSCP class-cos translation policy)，如图所示。

DSCP class-cos translation policy for L3 traffic

★ ?

Policy History

↻ ⬇

Properties

Translation Policy State: Disabled Enabled

User Level 1: CS0

User Level 2: CS1

User Level 3: CS2

Control Plane Traffic: CS3

Policy Plane Traffic: CS4

Span Traffic: CS5

Traceroute Traffic: CS6

ACI配置步骤8 (可选)。创建具有远程枝叶的虚拟端口通道(vPC)显式保护组

由于远程枝叶交换机已注册到ACI交换矩阵，因此您可以使用远程枝叶创建vPC显式保护组。导航到交换矩阵>访问策略>交换机策略>策略>虚拟端口通道默认并创建显式VPC保护组(+)。 图像片段显示了不同的IP编址方案。

VPC Explicit Protection Group - VPC Protection Group Rleaf-Vpc

? ✕

Policy Faults History

⛔ ⚠ ⚡ ⬆

↻ ⬇ 🔍

Properties

Name: rleaf-vpc

Logical Pair ID: 234

VPC Domain Policy: default

Virtual IP: 11.0.3.130/32

Switch Pairs: Node ID Peer IP

20311.0.3.129/32

20411.0.7.129/32

<#root>

rleaf203#

show system internal epm vpc

Local TEP IP : 172.17.3.128

Peer TEP IP : 172.17.7.129

vPC configured : Yes

vPC VIP : 172.17.3.130

MCT link status : Up

Local vPC version bitmap : 0x7

Peer vPC version bitmap : 0x7

Negotiated vPC version : 3

Peer advertisement received : Yes

Tunnel to vPC peer : Up

vPC# 343

if : port-channel1, if index : 0x16000000

local vPC state : MCEC_STATE_UP, peer vPC state : MCEC_STATE_UP

current link state : LOCAL_UP_PEER_UP

vPC fast conv : Off

rleaf203#

验证

RLeaf TEP审核

远程枝叶数据平面隧道终端(RL-DP-PTEP) — 此IP地址从分配给远程位置的TEP池分配给每个远程枝叶交换机。当远程枝叶节点不是vPC域的一部分时，来自远程枝叶节点的VXLAN数据包将用此TEP作为源IP地址发出。

远程枝叶vPC隧道终端(RL-vPC) — 这是从分配给远程位置的TEP池中分配给远程枝叶节点的vPC对的任播IP地址。如果远程枝叶交换机是vPC域的一部分，则源自两个远程枝叶交换机的所有VXLAN数据包均源自此TEP地址。

<#root>

rleaf203#

show ip int vrf overlay-1

IP Interface Status for VRF "overlay-1"

eth1/54.6, Interface status: protocol-up/link-up/admin-up, iod: 64, mode: external

IP address: 10.10.22.11, IP subnet: 10.10.22.0/24

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

lo0, Interface status: protocol-up/link-up/admin-up, iod: 4, mode: ptep

IP address: 172.17.3.128, IP subnet: 172.17.3.128/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

lo1, Interface status: protocol-up/link-up/admin-up, iod: 65, mode: unspecified

IP address: 172.16.203.203, IP subnet: 172.16.203.203/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

lo2, Interface status: protocol-up/link-up/admin-up, iod: 72, mode: vpc

IP address: 172.17.3.130, IP subnet: 172.17.3.130/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

lo3, Interface status: protocol-up/link-up/admin-up, iod: 75, mode: dp-ptep

IP address: 172.17.3.129, IP subnet: 172.17.3.129/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

lo1023, Interface status: protocol-up/link-up/admin-up, iod: 66, mode: ftep

IP address: 172.17.0.32, IP subnet: 172.17.0.32/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

rleaf203#

<#root>

rleaf204#

show ip int vrf overlay-1

IP Interface Status for VRF "overlay-1"

```

eth1/54.6, Interface status: protocol-up/link-up/admin-up, iod: 64, mode: external
  IP address: 10.10.21.11, IP subnet: 10.10.21.0/24
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 1, tag: 0
lo0, Interface status: protocol-up/link-up/admin-up, iod: 4, mode: ptep
  IP address: 172.17.7.128, IP subnet: 172.17.7.128/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 1, tag: 0
lo1, Interface status: protocol-up/link-up/admin-up, iod: 65, mode: unspecified
  IP address: 172.16.204.204, IP subnet: 172.16.204.204/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 1, tag: 0
lo2, Interface status: protocol-up/link-up/admin-up, iod: 71, mode: dp-ptep

  IP address: 172.17.7.129, IP subnet: 172.17.7.129/32

  IP broadcast address: 255.255.255.255

  IP primary address route-preference: 1, tag: 0

lo9, Interface status: protocol-up/link-up/admin-up, iod: 81, mode: vpc

  IP address: 172.17.3.130, IP subnet: 172.17.3.130/32

  IP broadcast address: 255.255.255.255

  IP primary address route-preference: 1, tag: 0

lo1023, Interface status: protocol-up/link-up/admin-up, iod: 66, mode: ftep
  IP address: 172.17.0.32, IP subnet: 172.17.0.32/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 1, tag: 0
rleaf204#

```

主干TEP审核

远程枝叶单播隧道终端(RL-UCAST) — 这是本地TEP池的任播IP地址部分，自动分配给与远程枝叶交换机关联的所有主干。当从连接到RLEAF节点的终端向ACI主Pod发送单播数据包时，VXLAN封装的数据包将以RL-Ucast-TEP地址作为目标发送，以RL-DP-TEP或RL-vPC作为源发送。因此，ACI主DC Pod中的任何主干都可以接收流量，将其解封，执行所需的L2或L3查找，最后将其重新封装并转发到最终目的地。

远程枝叶 单播-组播隧道终端(RL-MCAST-HREP) — 这是本地TEP池的另一个任播IP地址部分，自

动分配给与远程枝叶交换机关联的所有主干。当连接到远程枝叶节点的终端生成BUM (第2层广播、未知单播或组播) 流量时，数据包由RLEAF节点进行VXLAN封装，并以RL-Mcast-TEP地址作为目的地发送，以RL-DP-TEP或RL-vPC作为源发送。ACI Pod中的任何主干都可以接收BUM流量并将其转发到交换矩阵内。

<#root>

spine501#

show ip int vrf overlay-1

< snip >

lo12, Interface status: protocol-up/link-up/admin-up, iod: 88, mode: rl-mcast-hrep

IP address: 10.0.0.37, IP subnet: 10.0.0.37/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

lo13, Interface status: protocol-up/link-up/admin-up, iod: 91, mode: rl-ucast

IP address: 10.0.0.36, IP subnet: 10.0.0.36/32

IP broadcast address: 255.255.255.255

IP primary address route-preference: 1, tag: 0

spine501#

<#root>

spine601#

show ip int vrf overlay-1

< snip >

lo11, Interface status: protocol-up/link-up/admin-up, iod: 76, mode: rl-mcast-hrep

IP address: 10.0.0.37, IP subnet: 10.0.0.37/32

```
IP broadcast address: 255.255.255.255
```

```
IP primary address route-preference: 1, tag: 0
```

```
lo12, Interface status: protocol-up/link-up/admin-up, iod: 79, mode: rl-ucast
```

```
IP address: 10.0.0.36, IP subnet: 10.0.0.36/32
```

```
IP broadcast address: 255.255.255.255
```

```
IP primary address route-preference: 1, tag: 0
```

```
spine601#
```

远程枝叶可路由子网

如果可通过IPN/ISN/WAN访问APIC，则无需远程子网即可发现远程枝叶节点。此子网用于为主干交换机上的APIC创建NAT条目并支持vPOD。此功能也可以与RL Direct配合使用。

F0467配置失败

如果使用该向导将远程枝叶添加到Pod，该向导不会配置此处列出的所需访问策略，并且您会看到常见的F0467故障消息。您需要手动创建它们。

- 远程枝叶节点和枝叶选择器的枝叶交换机配置文件
- 远程枝叶节点的枝叶接口配置文件和上行链路的接口选择器
- 访问接口策略组

```
F0467 Fault delegate: Configuration failed for uni/tn-infra/out-rl-infra.l3out/instP-ipnInstP node 203
topology/pod-1/node-203/local/svc-policyelem-id-0/uni/epp/rtd-[uni/tn-infra/out-rl-infra.l3out/instP-ipnInstP]
```

Bootstrap验证

由于启用Bootscrip验证，可能无法发现远程枝叶。

基本上，启用Bootscrip验证后，枝叶会启动并了解其应通过DHCP运行的版本，然后它应从

APICS下载映像。但问题是，对于启用了RL直接的远程，必须在枝叶上安装特定的tcam规则，以允许已转换的APIC流量。因为Bootsript验证失败了这些规则，并且对象未安装在RL上。但是，由于这些对象/规则未安装，因此无法从APIC成功下载映像。

如果您遇到这种情况，请尝试在BSV关闭的情况下发现RL。

相关信息

- <https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-740861.html>
- [技术支持和文档 - Cisco Systems](#)

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