实施ACI传输路由(Multipod)

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简介

本文档介绍如何在以应用为中心的基础设施(ACI)多Pod环境中配置传输路由。

先决条件

要求

Cisco 建议您了解以下主题：

1. ACI多面板
2. L3Out
3. 合同
4. 路由协议

使用的组件

本文档中的信息基于以下软件和硬件版本：

1. 2台N5K-C5548UP交换机，均在NXOS版本7.3(8)上（用作外部路由器）
2. 1台N9K-C9332PQ枝叶交换机和1台N9K-C93108TC-EX枝叶交换机，均位于ACI版本14.2(7f)上
3. 2台N9K-C9336PQ主干交换机，均位于ACI版本14.2(7f)上
4. 1台N9K-C9232C交换机（用作IPN设备），位于NXOS版本10.3(3)上

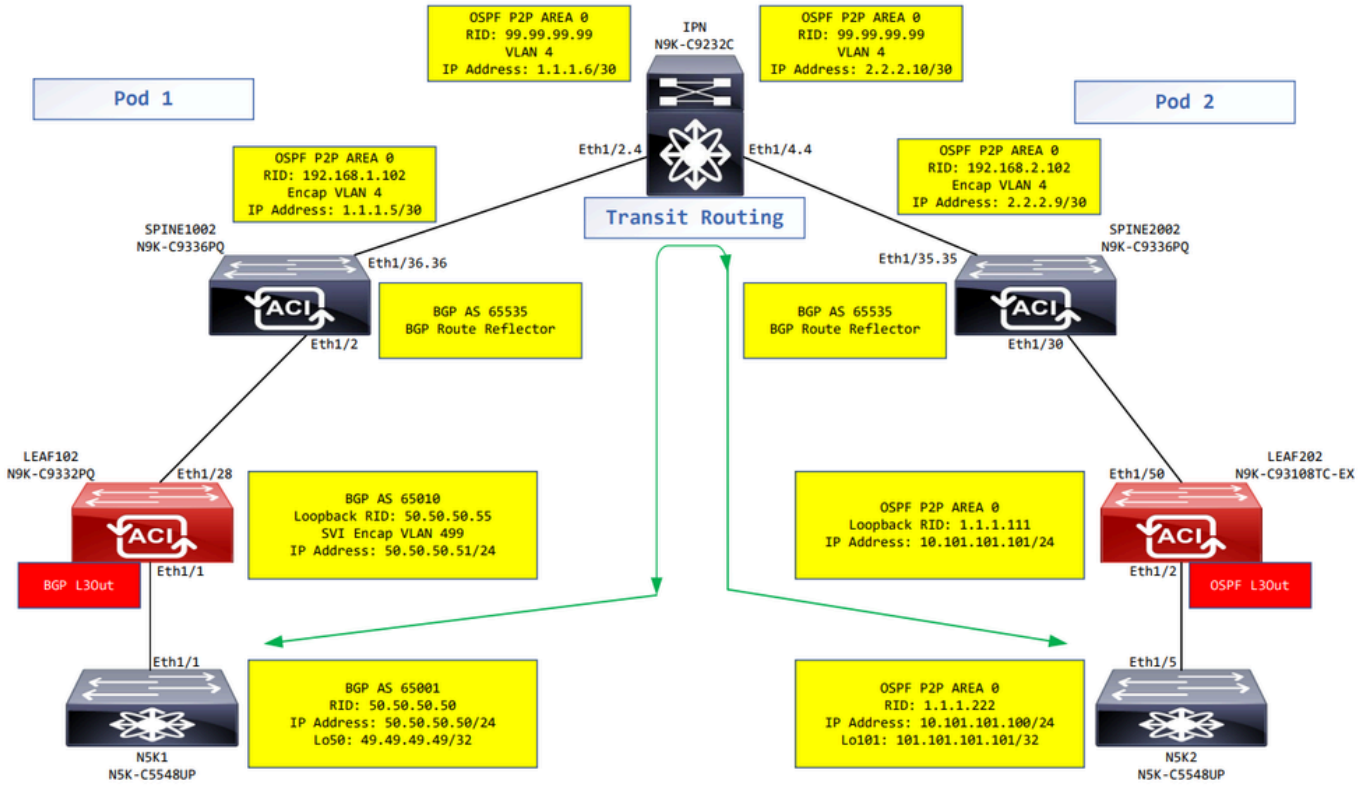
本文档中的信息是在特定实验环境中使用上述设备创建的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

在传输路由中，思科ACI交换矩阵将从一个第3层输出(L3Out)连接获知的路由通告到另一个L3Out连接。外部第3层域与边界枝叶交换机上的交换矩阵对等。交换矩阵是对等体之间的中转多协议边界网关协议(MP-BGP)域。

配置

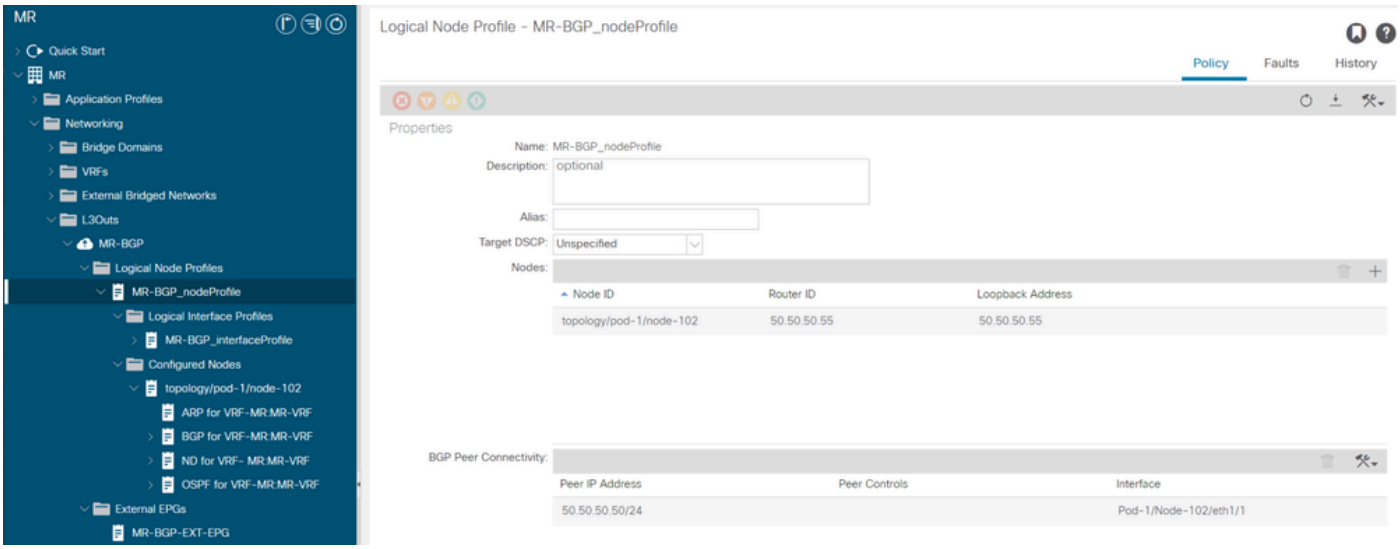
网络图



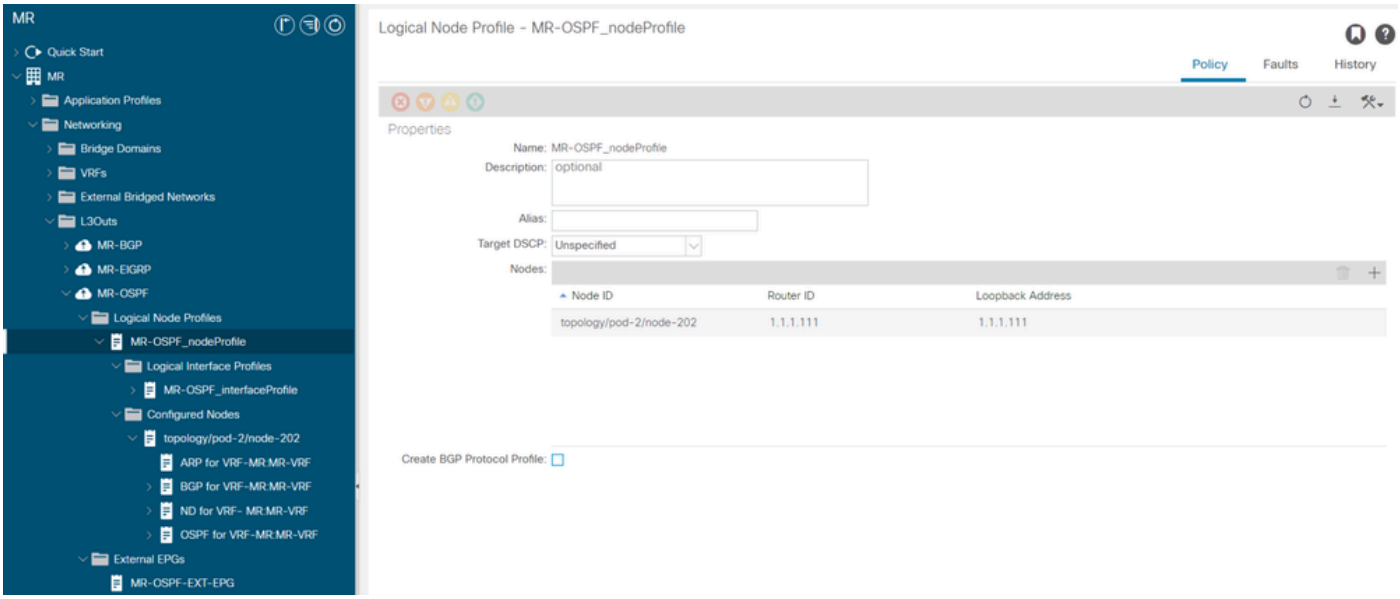
网络图

配置

逻辑节点配置文件用于标识连接到外部网络的枝叶交换机，并且可以向其部署路由协议或静态路由。要查看L3Out中的逻辑节点配置文件，请导航到 Tenant > Networking > L3Outs > L3Out > Logical Node Profiles > Logical Node Profile 如图所示.

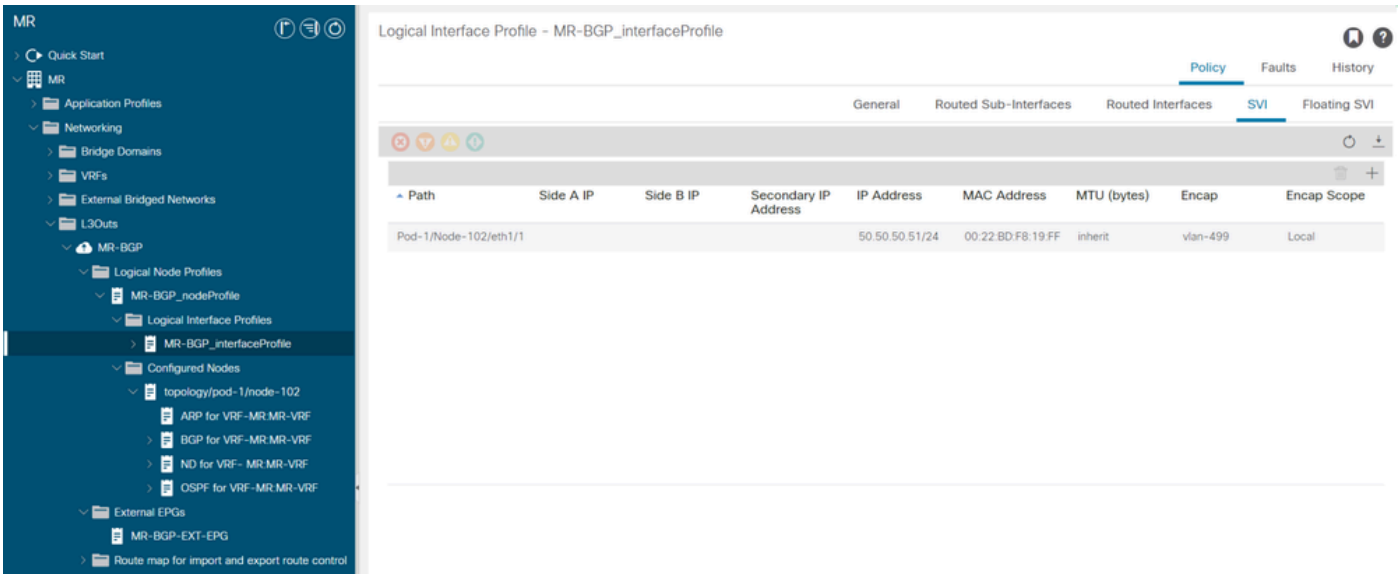


LEAF102的逻辑节点配置文件

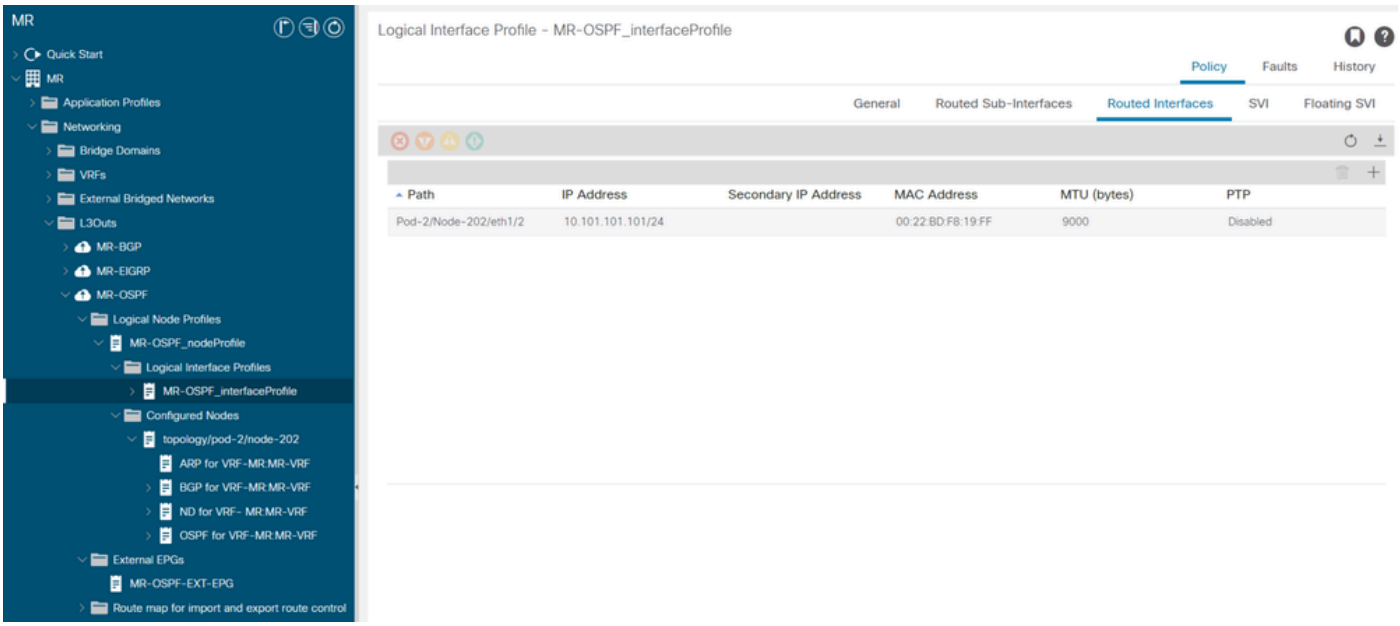


LEAF202的逻辑节点配置文件

逻辑接口配置文件用于标识连接到外部设备的L3Out接口。您会看到为虚拟路由和转发(VRF)定义的几个功能元素：地址解析协议(ARP)、边界网关协议(BGP)、邻居发现和开放最短路径优先(OSPF)，这是两个配置文件的结果。 要查看L3Out中的逻辑接口配置文件，请导航到 Tenant > Networking > L3Outs > L3Out > Logical Node Profiles > Logical Node Profile > Logical Interface Profiles > Logical Interface Profile.在这些示例中，在逻辑接口配置文件中配置了SVI。

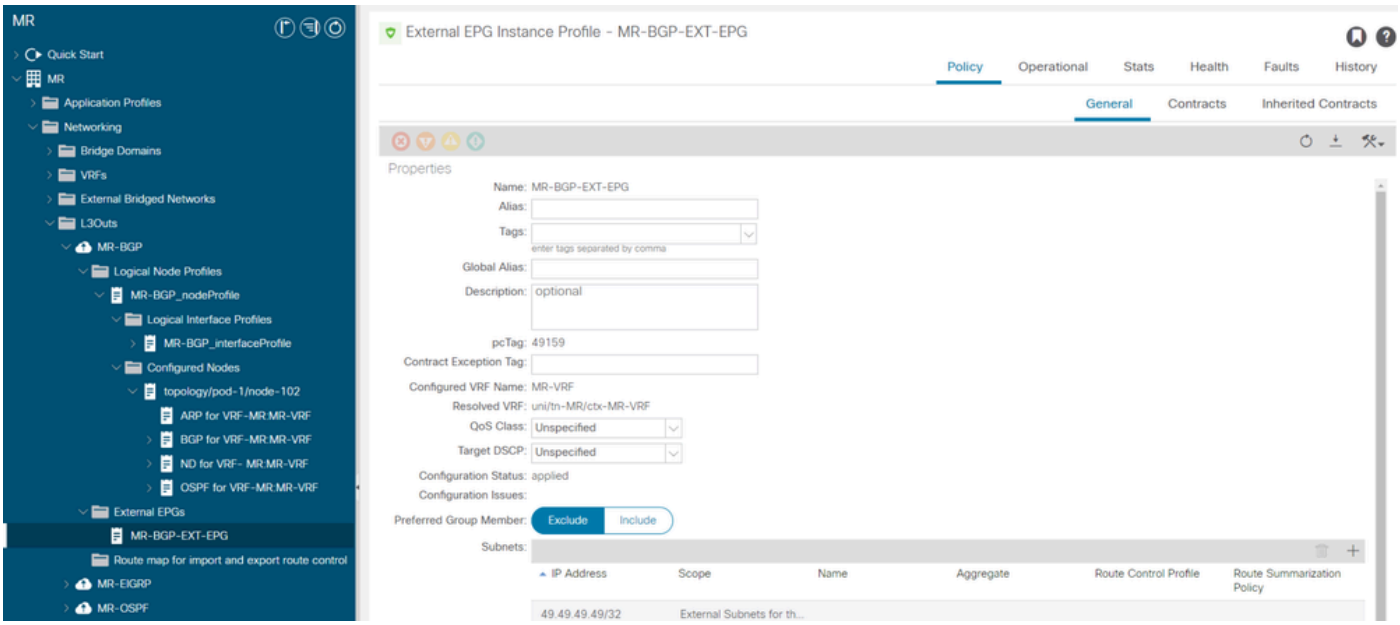


LEAF102、eth1/1的逻辑接口配置文件

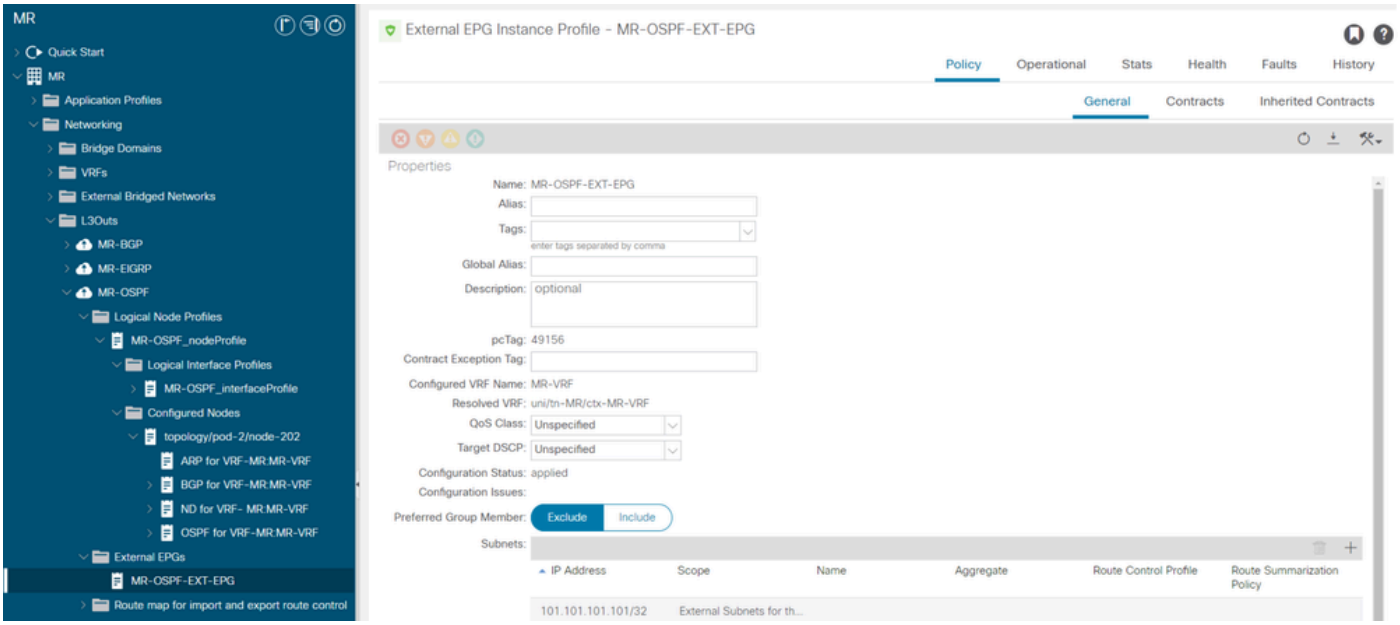


LEAF202的逻辑接口配置文件，eth1/2

外部EPG实例配置文件（外部EPG、L3Out EPG）表示具有相同安全行为的一组外部子网。其他子网也可以与其他作用域关联，这些作用域定义该子网的路由行为。 要查看L3Out中的外部EPG，请导航至 Tenant > Networking > L3Outs > L3Out > External EPGs > External EPG 如图所示.

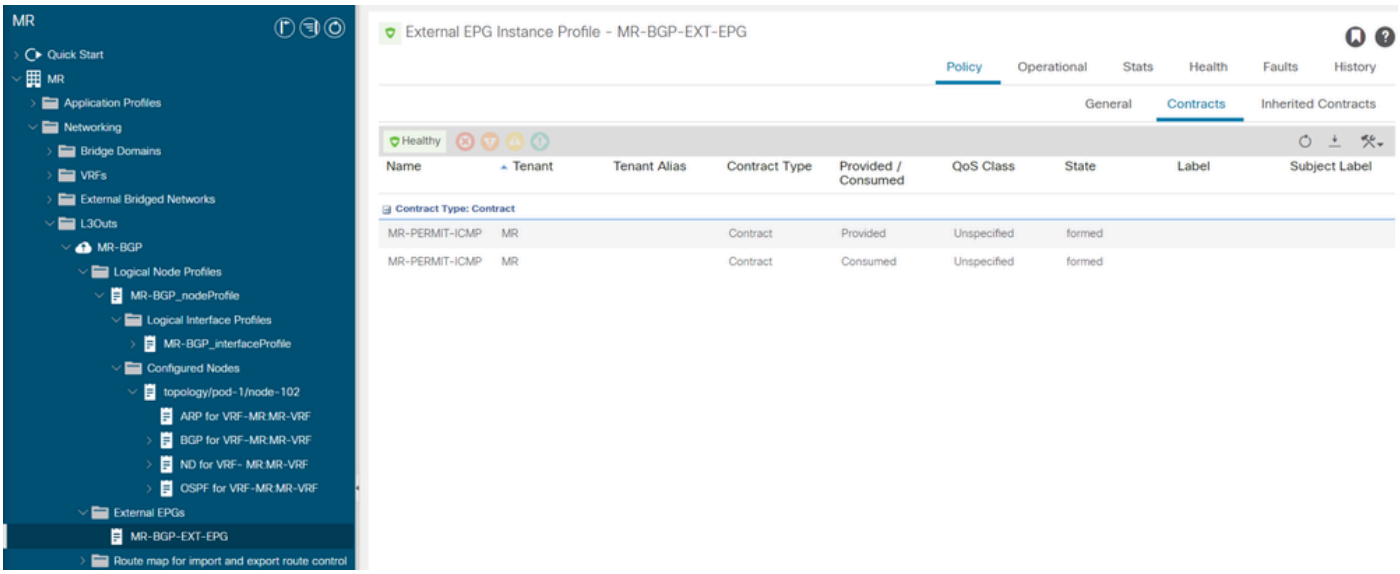


MR-BGP L3Out的外部EPG实例配置文件

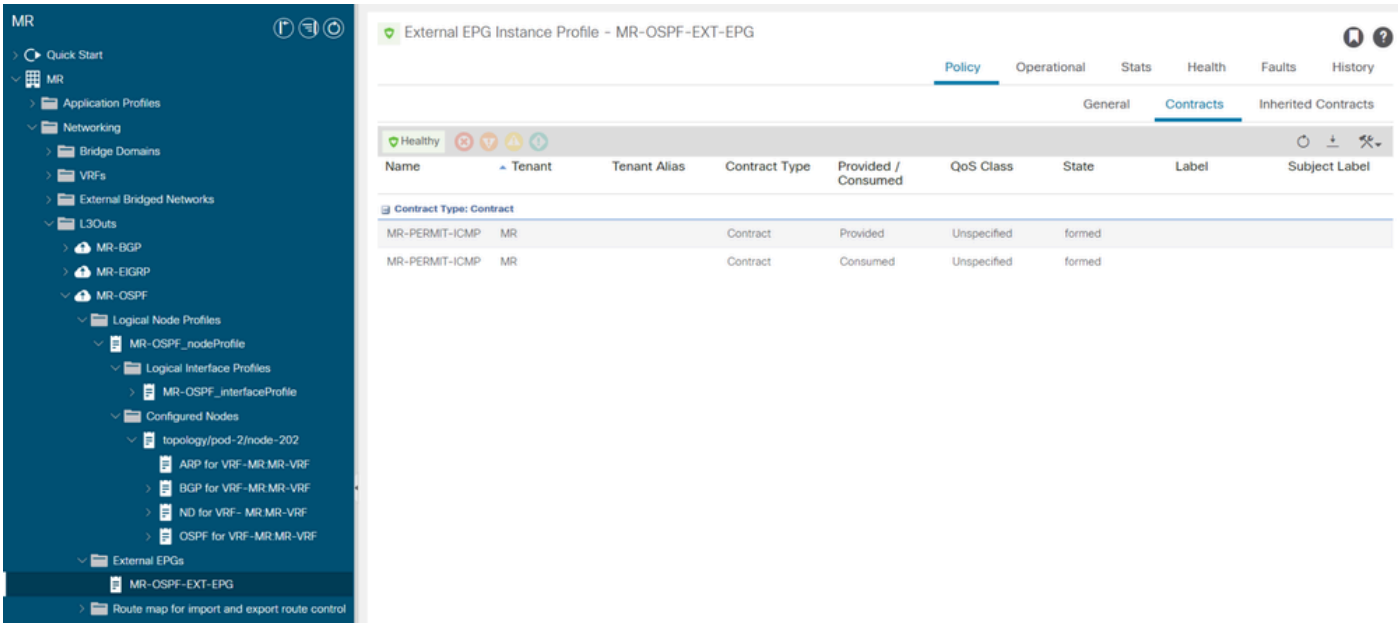


MR-OSPF L3Out的外部EPG实例配置文件

在这些示例中， MR-PERMIT-ICMP合同同时用作外部EPG中提供的和使用的合同。

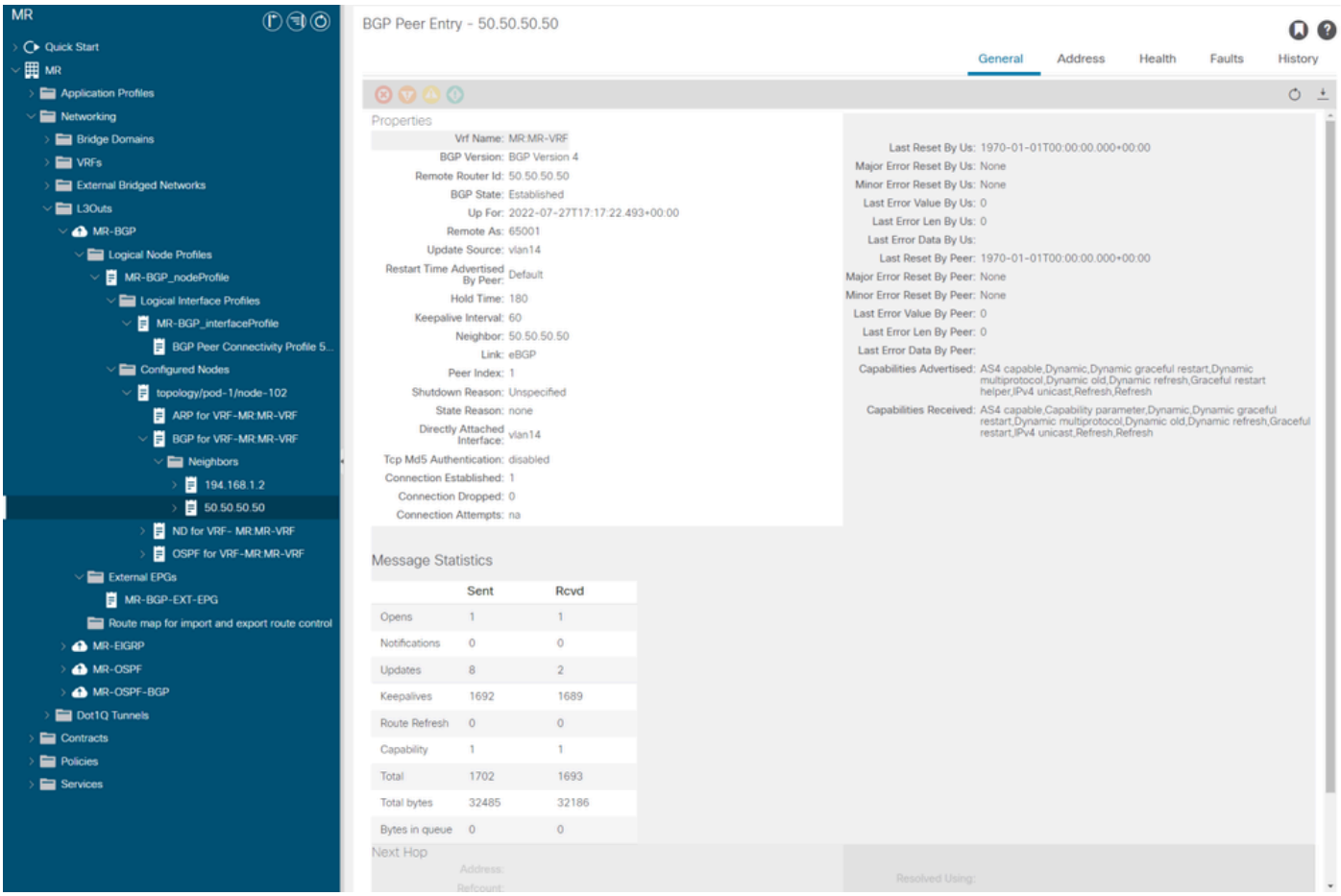


MR-PERMIT-ICMP合同适用于MR-BGP-EXT-EPG



MR-PERMIT-ICMP合同适用于MR-OSPF-EXT-EPG

开启 LEAF102,BGP与邻居建立 50.50.50.50 接收外部网络 49.49.49.49/32.



LEAF102上的BGP对等条目

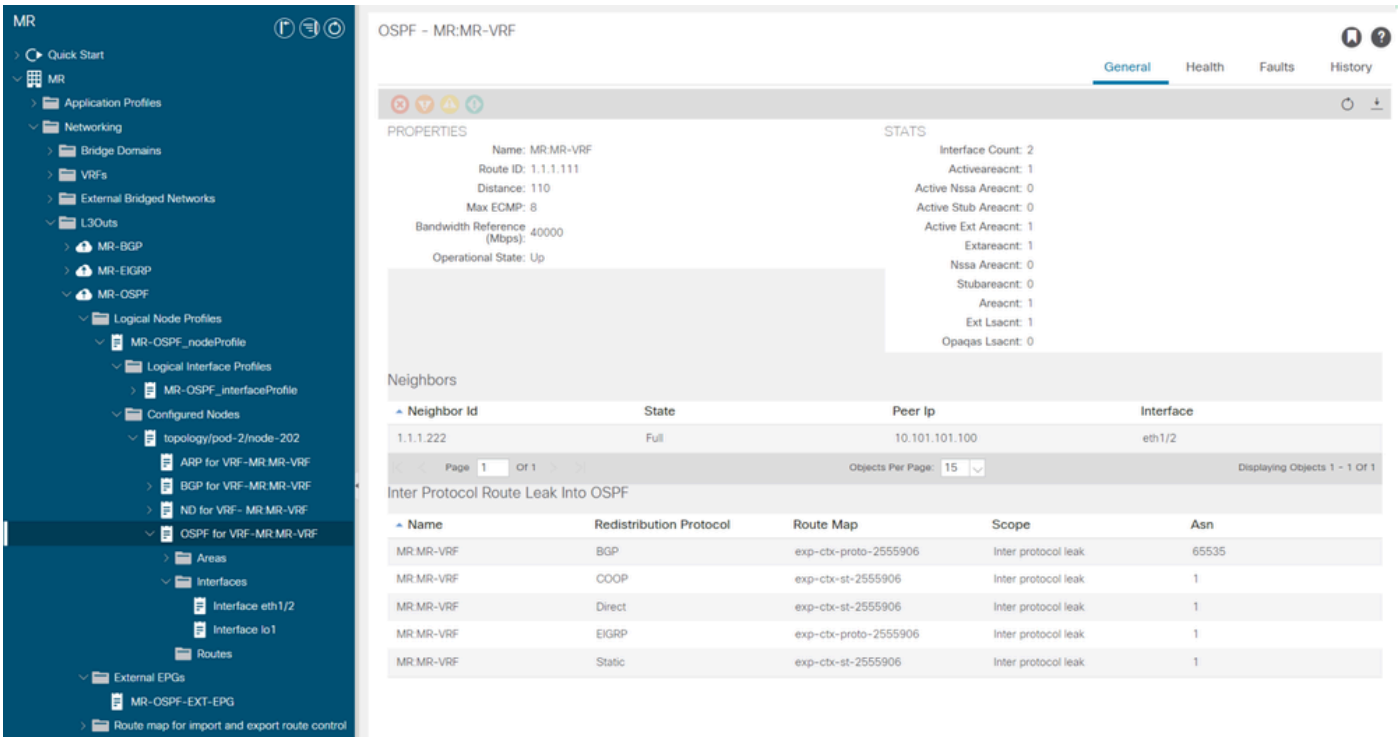
```
LEAF102# show ip bgp summary vrf MR:MR-VRF
BGP summary information for VRF MR:MR-VRF, address family IPv4 Unicast
BGP router identifier 50.50.50.55, local AS number 65535
BGP table version is 37, IPv4 Unicast config peers 4, capable peers 2
14 network entries and 16 paths using 1952 bytes of memory
BGP attribute entries [12/1776], BGP AS path entries [0/0]
BGP community entries [0/0], BGP clusterlist entries [5/28]

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
50.50.50.50     4 65001    1691    1700       37    0    0    1d04h 1
```

LEAF102上VRF MR:MR-VRF的BGP摘要

```
LEAF102# show ip route bgp vrf MR:MR-VRF
IP Route Table for VRF "MR:MR-VRF"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

49.49.49.49/32, ubest/mbest: 1/0
    *via 50.50.50.50%MR:MR-VRF, [20/0], 1d04h, bgp-65535, external, tag 65010
```

LEAF102上VRF MR:MR-VRF的BGP路由

开启 LEAF202,OSPF与邻居建立 1.1.1.222 接收外部网络 101.101.101.101/32.



LEAF202上的OSPF邻居条目

```
LEAF202# show ip ospf neighbors vrf MR:MR-VRF
 OSPF Process ID default VRF MR:MR-VRF
 Total number of neighbors: 1
 Neighbor ID     Pri State            Up Time  Address         Interface
 1.1.1.222         1 FULL/ -          2d04h    10.101.101.100  Eth1/2
```

LEAF202上VRF MR:MR-VRF的OSPF邻居

```
LEAF202# show ip route ospf vrf MR:MR-VRF
IP Route Table for VRF "MR:MR-VRF"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

101.101.101.101/32, ubest/mbest: 1/0
    *via 10.101.101.100, eth1/2, [110/41], 1d00h, ospf-default, intra
```

LEAF202上VRF MR:MR-VRF的OSPF路由

两者 LEAF102 和 LEAF202,VRF的MP-BGP表显示外部BGP网络， 49.49.49.49/32，但它显示为外部的 LEAF102 和内部 LEAF202.OSPF外部网络， 101.101.101.101/32也出现在两个枝叶交换机上的BGP表中；打开 LEAF202 它显示为从OSPF和on LEAF102 显示为internal。

```
LEAF102# show bgp vpnv4 unicast vrf MR:MR-VRF
BGP routing table information for VRF overlay-1, address family VPNv4 Unicast
BGP table version is 119, local router ID is 10.0.232.68
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup

   Network            Next Hop            Metric     LocPrf     Weight Path
Route Distinguisher: 102:2555906    (VRF MR:MR-VRF)
*>e49.49.49.49/32     50.50.50.50                              0 65010 65001 i
*>i101.101.101.101/32 20.0.248.0             41        100          0 ?
```

LEAF102上VRF MR:MR-VRF的MP-BGP表

```
LEAF202# show bgp vpnv4 unicast vrf MR:MR-VRF
BGP routing table information for VRF overlay-1, address family VPNv4 Unicast
BGP table version is 95, local router ID is 20.0.248.0
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup

   Network            Next Hop            Metric     LocPrf     Weight Path
Route Distinguisher: 202:2555906    (VRF MR:MR-VRF)
*>i49.49.49.49/32     10.0.232.68                      100          0 65010 65001 i
*>r101.101.101.101/32 0.0.0.0                  41        100      32768 ?
```

LEAF202上VRF MR:MR-VRF的MP-BGP表

BGP IPv4表包含等效信息。

```
LEAF102# show bgp ipv4 unicast vrf MR:MR-VRF
BGP routing table information for VRF MR:MR-VRF, address family IPv4 Unicast
BGP table version is 37, local router ID is 50.50.50.55
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup

   Network            Next Hop            Metric     LocPrf     Weight Path
*>e49.49.49.49/32     50.50.50.50                                   0 65010 65001 i
*>i101.101.101.101/32 20.0.248.0               41        100          0 ?
```

LEAF102上VRF MR:MR-VRF的BGP IPv4表

```
LEAF202# show bgp ipv4 unicast vrf MR:MR-VRF
BGP routing table information for VRF MR:MR-VRF, address family IPv4 Unicast
BGP table version is 31, local router ID is 1.1.1.111
Status: s-suppressed, x-deleted, S-stale, d-dampened, h-history, *-valid, >-best
Path type: i-internal, e-external, c-confed, l-local, a-aggregate, r-redist, I-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup

   Network            Next Hop            Metric     LocPrf     Weight Path
*>i49.49.49.49/32     10.0.232.68                      100          0 65010 65001 i
*>r101.101.101.101/32 0.0.0.0                  41        100      32768 ?
```

LEAF202上VRF MR:MR-VRF的BGP IPv4表

但是，OSPF外部网络、 101.101.101.101/32不在的路由表中 N5K1.

```
N5K1# show ip route vrf MR-BGP
IP Route Table for VRF "MR-BGP"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

49.49.49.49/32, ubest/mbest: 2/0, attached
    *via 49.49.49.49, Lo50, [0/0], 1d07h, local
    *via 49.49.49.49, Lo50, [0/0], 1d07h, direct
50.50.50.0/24, ubest/mbest: 1/0, attached
    *via 50.50.50.50, Vlan499, [0/0], 1d07h, direct
50.50.50.50/32, ubest/mbest: 1/0, attached
    *via 50.50.50.50, Vlan499, [0/0], 1d07h, local
```

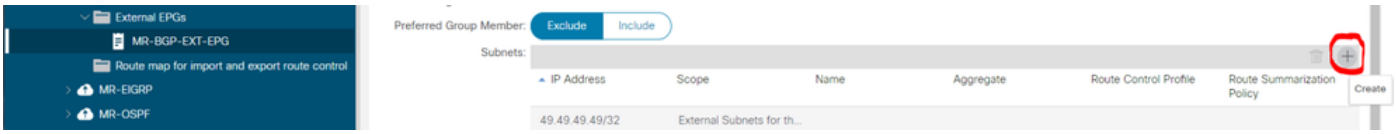
RIB，用于N5K1上的VRF MR-BGP

同样，BGP外部网络、 49.49.49.49/32 ，不在 N5K2 的肋骨。

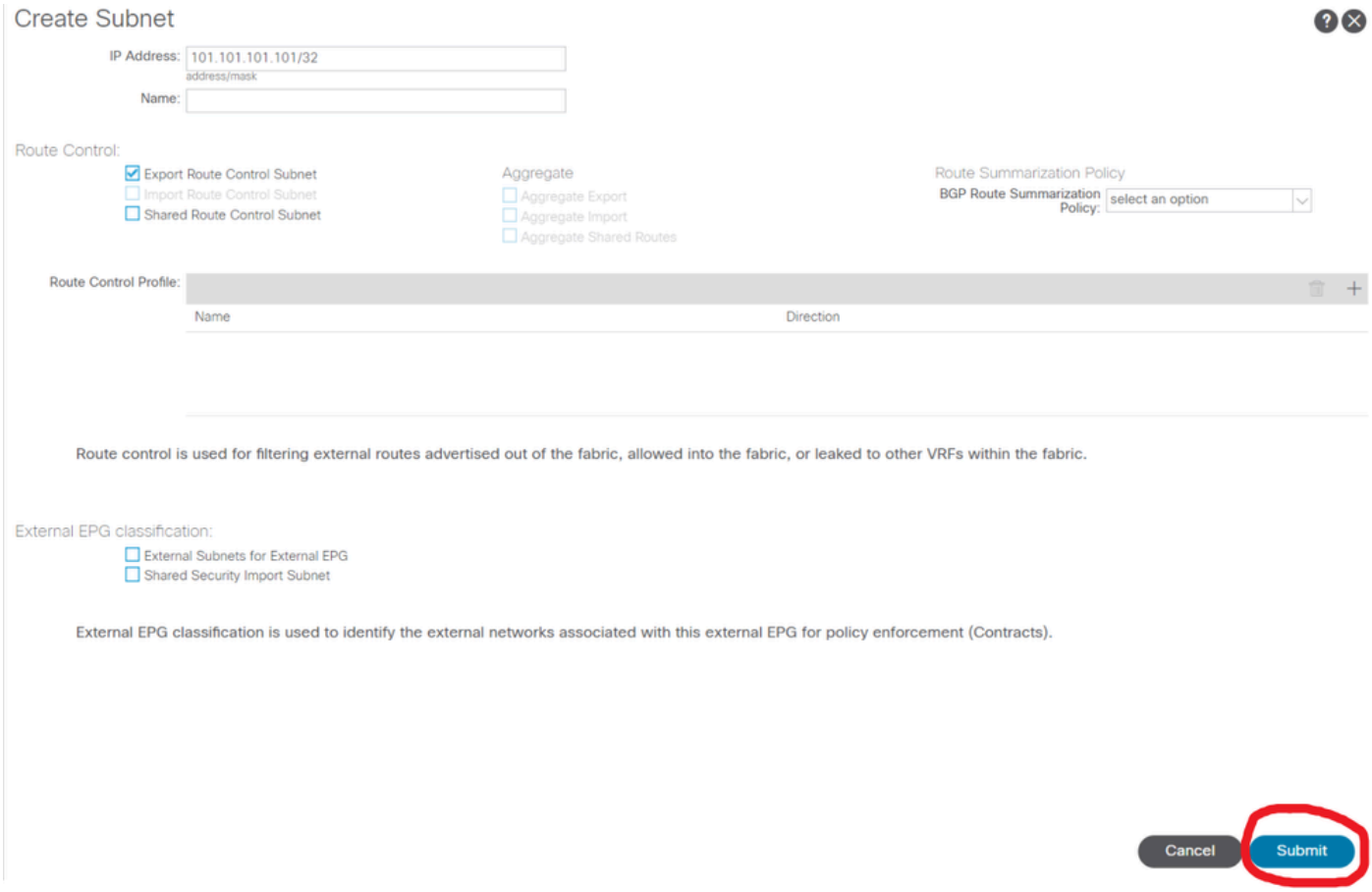
```
N5K2# show ip route vrf MR-OSPF
IP Route Table for VRF "MR-OSPF"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

1.1.1.111/32, ubest/mbest: 1/0
    *via 10.101.101.101, Eth1/5, [110/41], 2d05h, ospf-1, intra
10.101.101.0/24, ubest/mbest: 1/0, attached
    *via 10.101.101.100, Eth1/5, [0/0], 6d22h, direct
10.101.101.100/32, ubest/mbest: 1/0, attached
    *via 10.101.101.100, Eth1/5, [0/0], 6d22h, local
101.101.101.101/32, ubest/mbest: 2/0, attached
    *via 101.101.101.101, Lo101, [0/0], 2d04h, local
    *via 101.101.101.101, Lo101, [0/0], 2d04h, direct
```

RIB，用于N5K2上的VRF MR-OSPF

在BGP L3Out中，导航至 External EPGs > External EPG > Subnets 并选择 + 图标的右上角。输入从OSPF L3Out接收的外部子网的IP地址。 101.101.101.101/32. 选择 Export Route Control Subnet 如果 Route Control 并清除 External Subnets for the External EPG 分类。点击 Submit.此 Export Route Control Subnet 选项允许将网络导出（通告）到外部对等体。



创建新子网



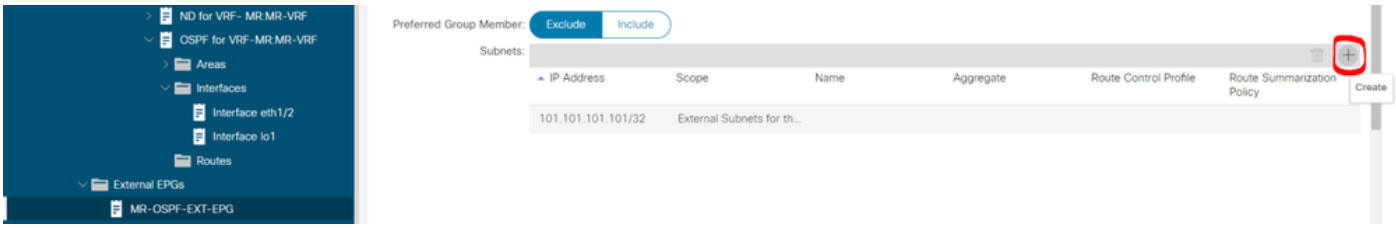
为新子网配置正确的选项

开启 N5K1,OSPF外部网络， 101.101.101.101/32现在通过BGP接收。

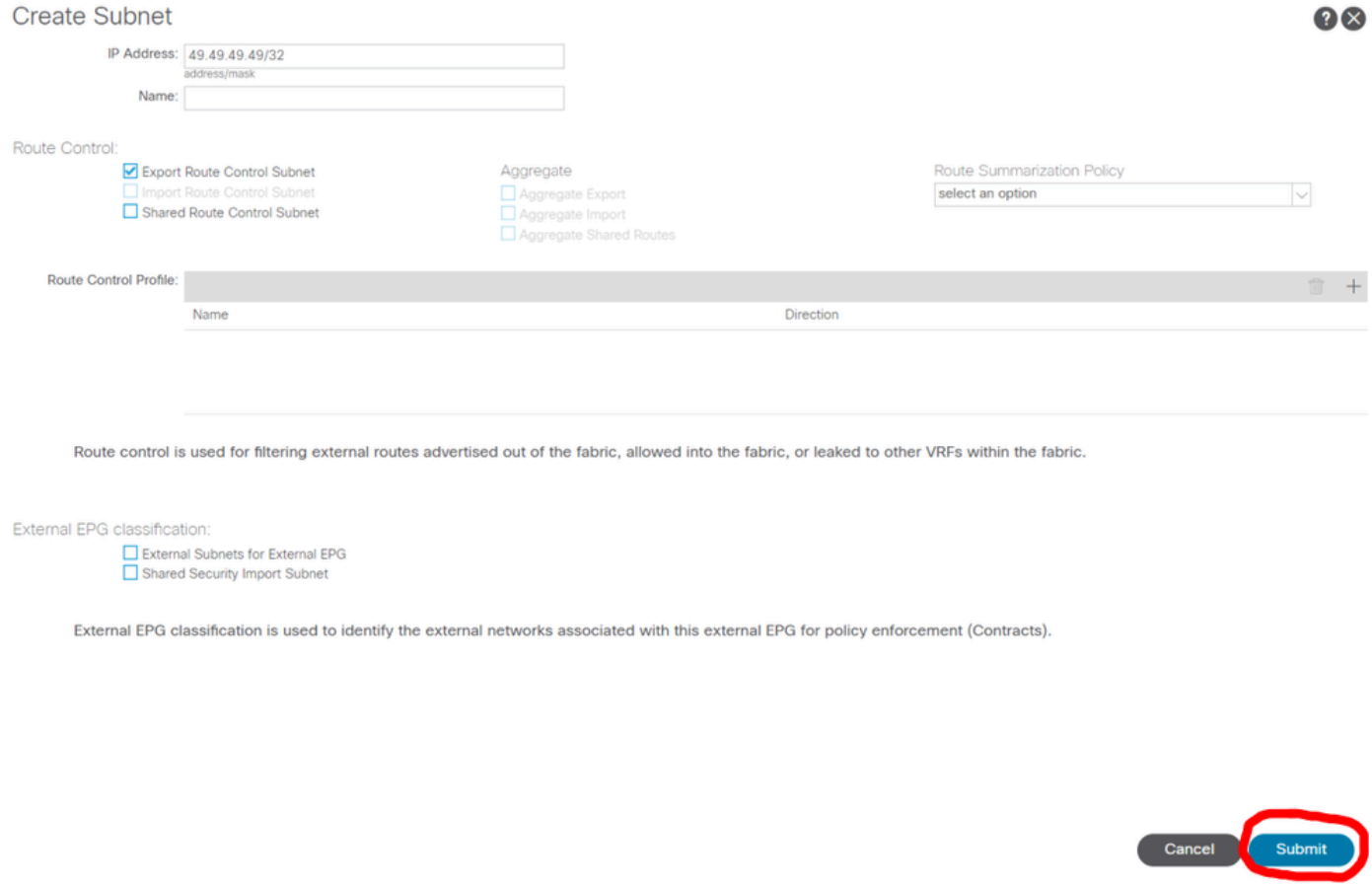
```
N5K1# show ip route vrf MR-BGP
IP Route Table for VRF "MR-BGP"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

49.49.49.49/32, ubest/mbest: 2/0, attached
    *via 49.49.49.49, Lo50, [0/0], 1d08h, local
    *via 49.49.49.49, Lo50, [0/0], 1d08h, direct
50.50.50.0/24, ubest/mbest: 1/0, attached
    *via 50.50.50.50, Vlan499, [0/0], 1d08h, direct
50.50.50.50/32, ubest/mbest: 1/0, attached
    *via 50.50.50.50, Vlan499, [0/0], 1d08h, local
101.101.101.101/32, ubest/mbest: 1/0
    *via 50.50.50.51, [20/0], 00:00:03, bgp-65001, external, tag 65010,
```

RIB，用于N5K1上的VRF MR-BGP

在OSPF L3Out中，导航至 External EPGs > External EPG > Subnets 并选择 + 图标的右上角。输入从BGP L3Out接收的外部子网的IP地址。 49.49.49.49/32. 选择 Export Route Control Subnet 如果 Route Control 部分并清除 External Subnets for the External EPG 分类。点击 Submit.



创建新子网



为新子网配置正确的选项

现在开始 N5K2,BGP外部网络， 49.49.49.49/32通过OSPF接收。

```
N5K2# show ip route vrf MR-OSPF
IP Route Table for VRF "MR-OSPF"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

1.1.1.111/32, ubest/mbest: 1/0
    *via 10.101.101.101, Eth1/5, [110/41], 2d05h, ospf-1, intra
10.101.101.0/24, ubest/mbest: 1/0, attached
    *via 10.101.101.100, Eth1/5, [0/0], 6d22h, direct
10.101.101.100/32, ubest/mbest: 1/0, attached
    *via 10.101.101.100, Eth1/5, [0/0], 6d22h, local
49.49.49.49/32, ubest/mbest: 1/0
    *via 10.101.101.101, Eth1/5, [110/1], 00:01:59, ospf-1, type-2, tag 4294967295,
101.101.101.101/32, ubest/mbest: 2/0, attached
    *via 101.101.101.101, Lo101, [0/0], 2d05h, local
    *via 101.101.101.101, Lo101, [0/0], 2d05h, direct
```

RIB，用于N5K2上的VRF MR-OSPF

Ping在两个网络之间运行，因为 MR-PERMIT-ICMP 之前应用于两个外部EPG的合同。

```
N5K1# ping 101.101.101.101 vrf MR-BGP source 49.49.49.49
PING 101.101.101.101 (101.101.101.101) from 49.49.49.49: 56 data bytes
64 bytes from 101.101.101.101: icmp_seq=0 ttl=252 time=3.059 ms
64 bytes from 101.101.101.101: icmp_seq=1 ttl=252 time=2.963 ms
64 bytes from 101.101.101.101: icmp_seq=2 ttl=252 time=7.928 ms
64 bytes from 101.101.101.101: icmp_seq=3 ttl=252 time=2.954 ms
64 bytes from 101.101.101.101: icmp_seq=4 ttl=252 time=2.982 ms

--- 101.101.101.101 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 2.954/3.977/7.928 ms
```

N5K1上的通信验证

```
N5K2# ping 49.49.49.49 vrf MR-OSPF source 101.101.101.101
PING 49.49.49.49 (49.49.49.49) from 101.101.101.101: 56 data bytes
64 bytes from 49.49.49.49: icmp_seq=0 ttl=252 time=3.107 ms
64 bytes from 49.49.49.49: icmp_seq=1 ttl=252 time=2.99 ms
64 bytes from 49.49.49.49: icmp_seq=2 ttl=252 time=2.98 ms
64 bytes from 49.49.49.49: icmp_seq=3 ttl=252 time=2.986 ms
64 bytes from 49.49.49.49: icmp_seq=4 ttl=252 time=2.99 ms

--- 49.49.49.49 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 2.98/3.01/3.107 ms
```

N5K2上的通信验证

相关信息

- 思科APIC第3层网络配置指南，版本6.0(x)
- 思科以应用为中心的基础设施基础知识，版本4.2(x)
- 思科APIC第3层网络配置指南，版本3.x及更低版本
- 思科技术支持和下载

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