實施ACI傳輸路由(Multipod)

目錄

簡介

本檔案介紹如何在以應用程式為中心的基礎架構(ACI)多容器環境中設定傳輸路由。

必要條件

需求

思科建議您瞭解以下主題：

1. ACI多腳架
2. L3Out
3. 合約
4. 路由協定

採用元件

本文中的資訊係根據以下軟體和硬體版本：

1. 2台N5K-C5548UP交換機，均在NXOS版本7.3(8)上（用作外部路由器）
2. 1個N9K-C9332PQ枝葉交換機和1個N9K-C93108TC-EX枝葉交換機，均位於ACI 14.2(7f)版上
3. 2台N9K-C9336PQ主幹交換機，均位於ACI 14.2(7f)版上
4. 1台N9K-C9232C交換機（用作IPN裝置）在NXOS版本10.3(3)上

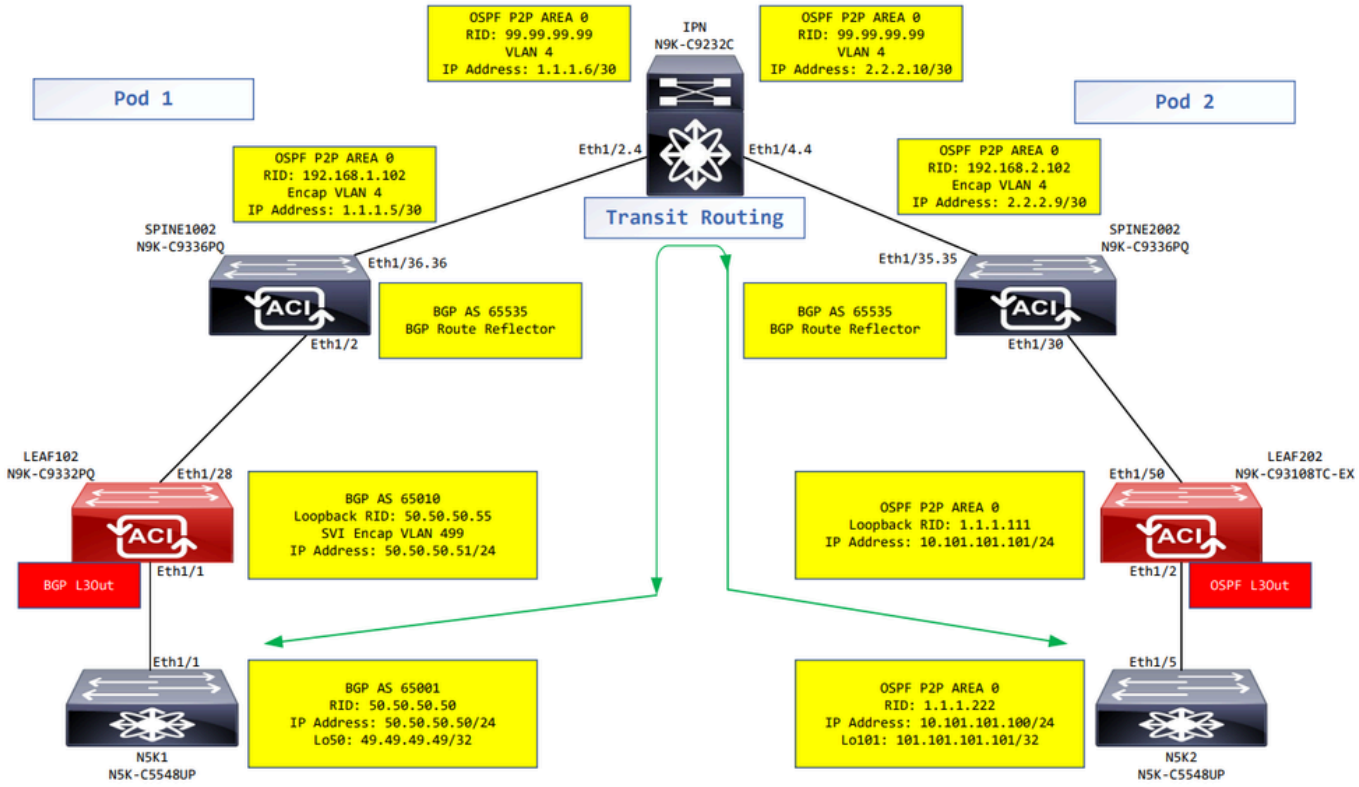
本文中的資訊是根據特定實驗室環境內的上述裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

背景資訊

在傳輸路由中，思科ACI交換矩陣將從一個第3層輸出(L3Out)連線獲知的路由通告到另一個L3Out連線。外部第3層域與邊界枝葉交換機上的交換矩陣對等。交換矩陣是對等體之間的傳輸多協定邊界網關協定(MP-BGP)域。

設定

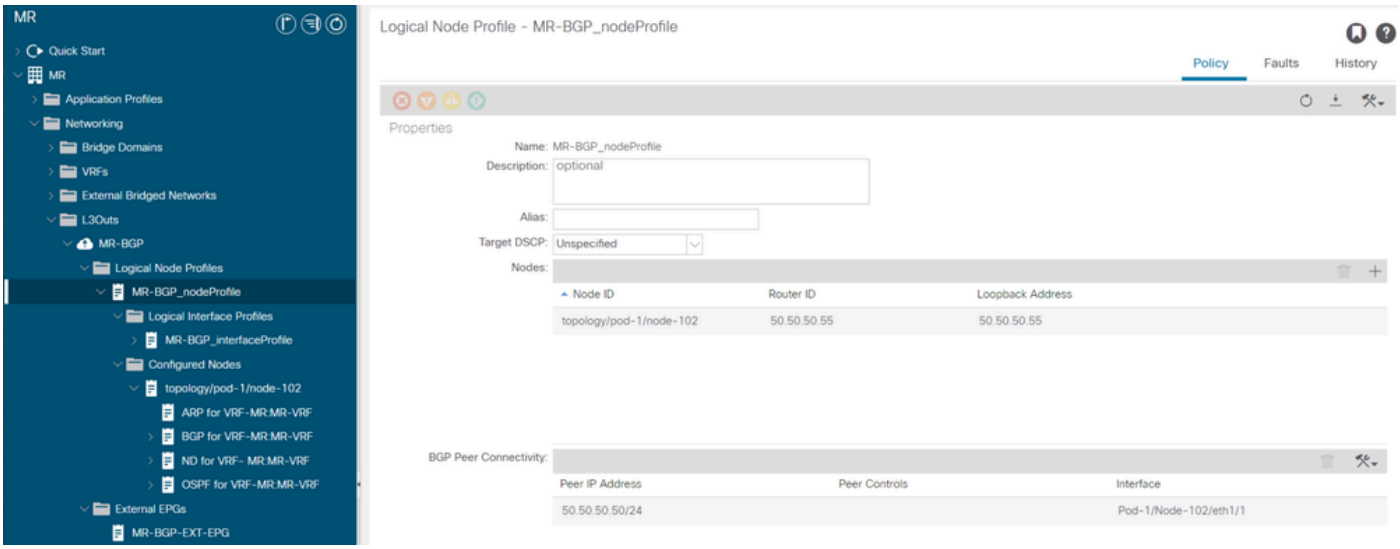
網路圖表



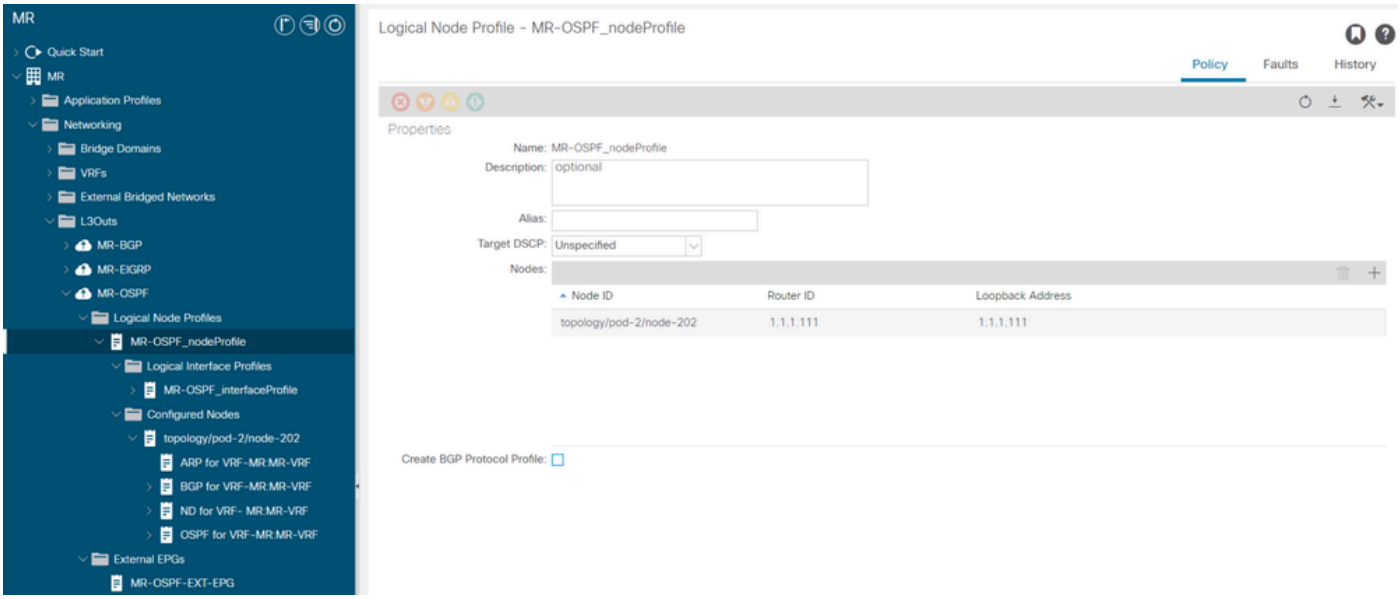
網路圖表

組態

邏輯節點配置檔案用於標識連線到外部網路的枝葉交換機，並且可以向其部署路由協定或靜態路由。要在L3Out中檢視邏輯節點配置檔案，請導航到 Tenant > Networking > L3Outs > L3Out > Logical Node Profiles > Logical Node Profile 如下圖所示。

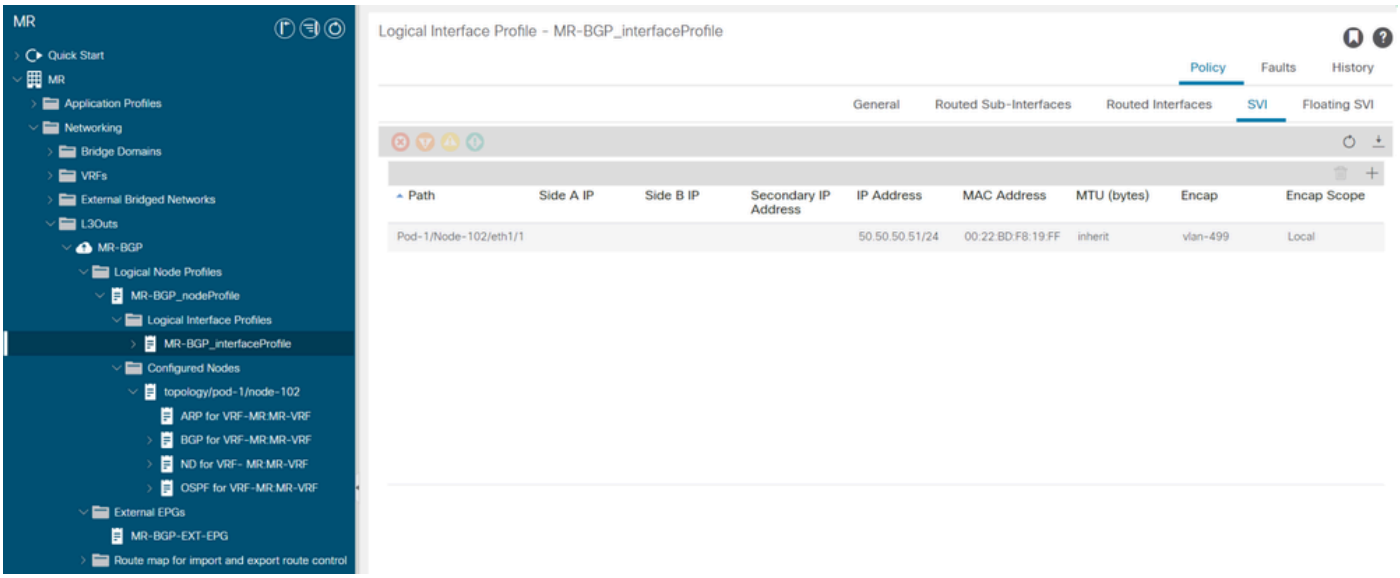


LEAF102的邏輯節點配置檔案

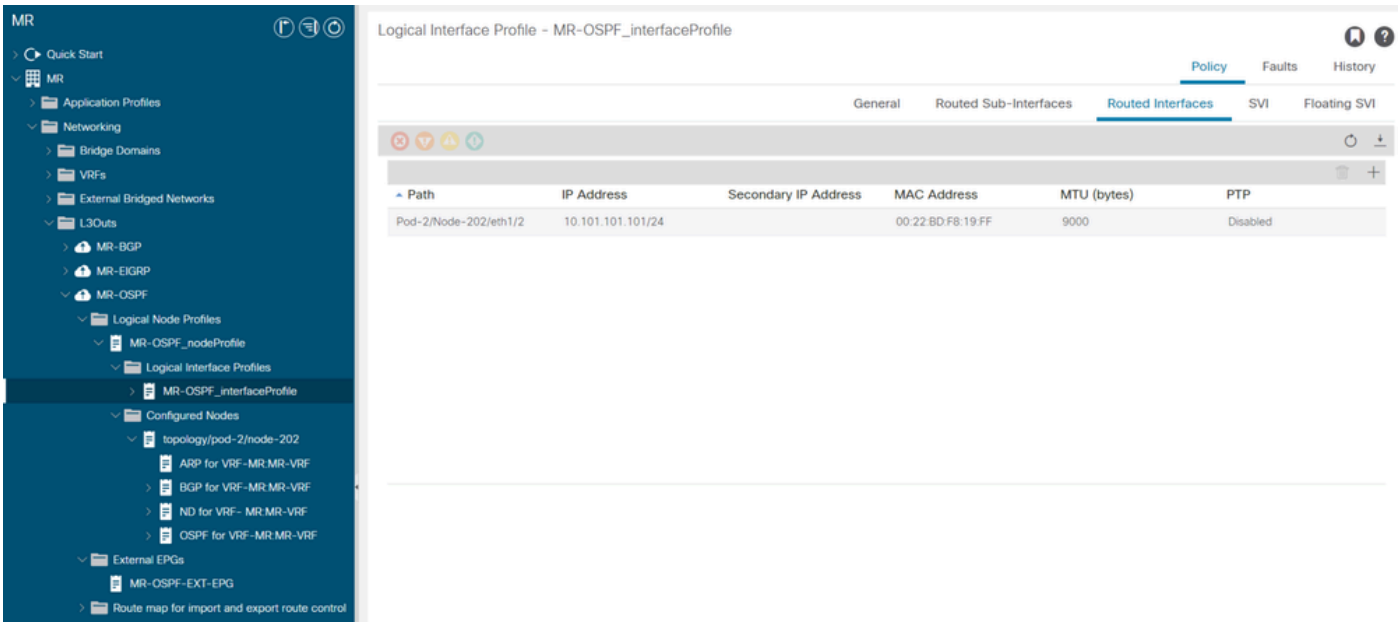


LEAF202的邏輯節點配置檔案

邏輯介面配置檔案用於標識連線到外部裝置的L3Out介面。您會看到為虛擬路由和轉送(VRF)定義的幾個功能元素：地址解析協定(ARP)、邊界網關協定(BGP)、鄰居發現和開放最短路徑優先(OSPF)，這是兩個配置檔案的結果。 要在L3Out中檢視邏輯介面配置檔案，請導航到 Tenant > Networking > L3Outs > L3Out > Logical Node Profiles > Logical Node Profile > Logical Interface Profiles > Logical Interface Profile.在這些示例中，在邏輯介面配置檔案中配置了SVI。

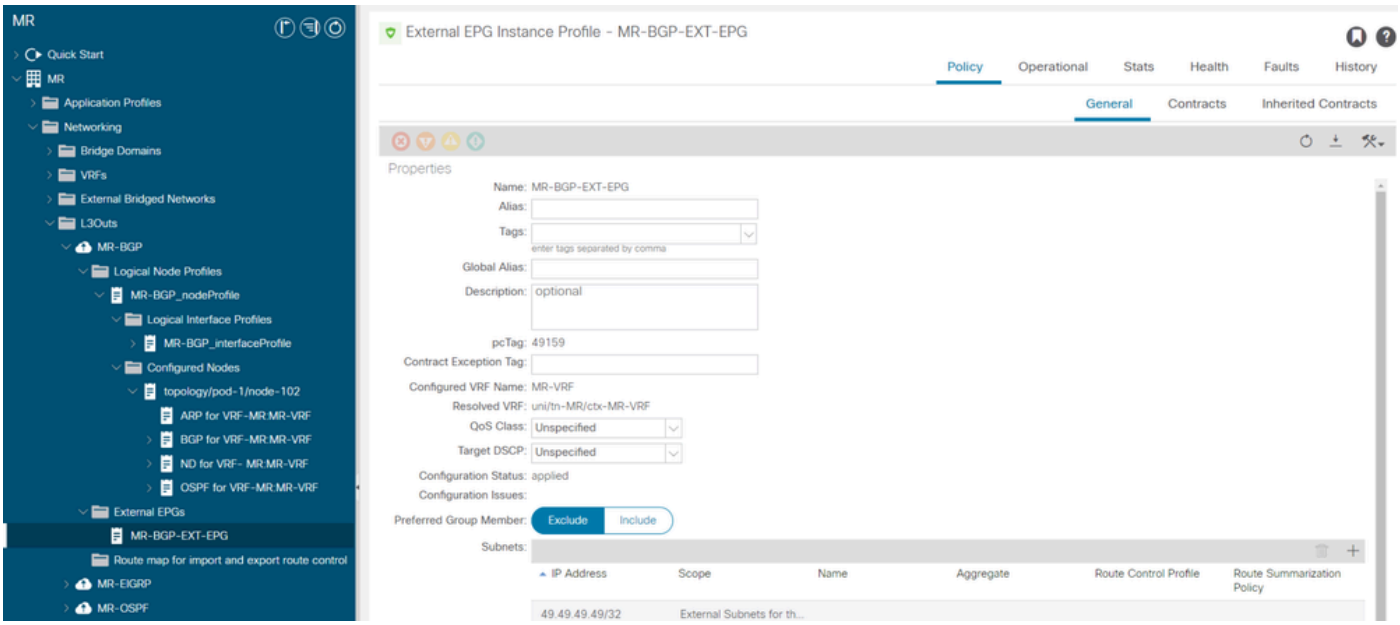


LEAF102, eth1/1的邏輯介面配置檔案

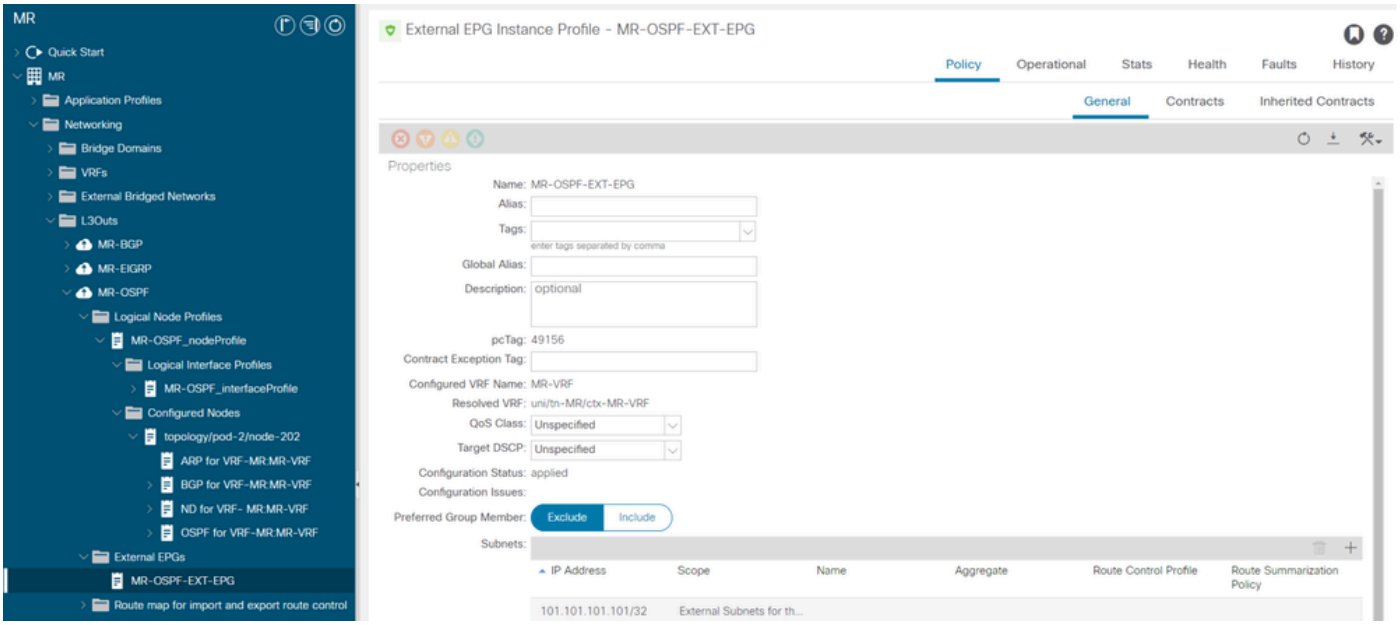


LEAF202, eth1/2的邏輯介面配置檔案

外部EPG例項配置檔案（外部EPG、L3Out EPG）表示具有相同安全行為的外部子網組。其他子網還可以與其他範圍關聯，這些範圍定義了該子網的路由行為。 要在L3Out中檢視外部EPG，請導航到 Tenant > Networking > L3Outs > L3Out > External EPGs > External EPG 如下圖所示。

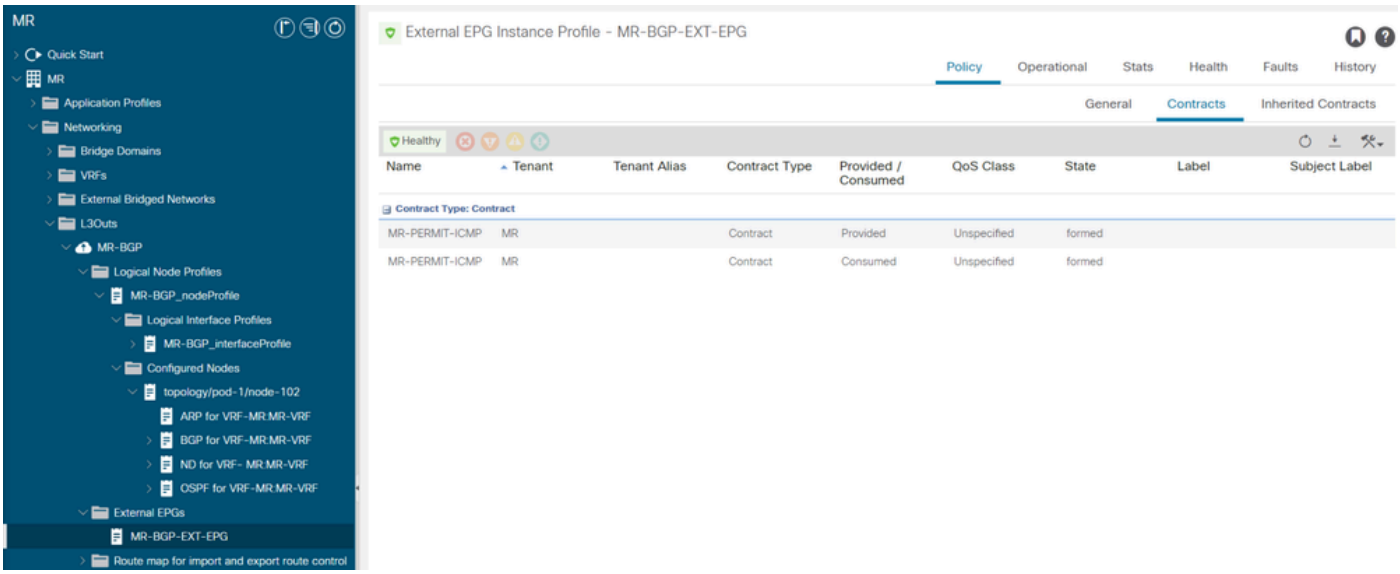


MR-BGP L3Out的外部EPG例項配置檔案

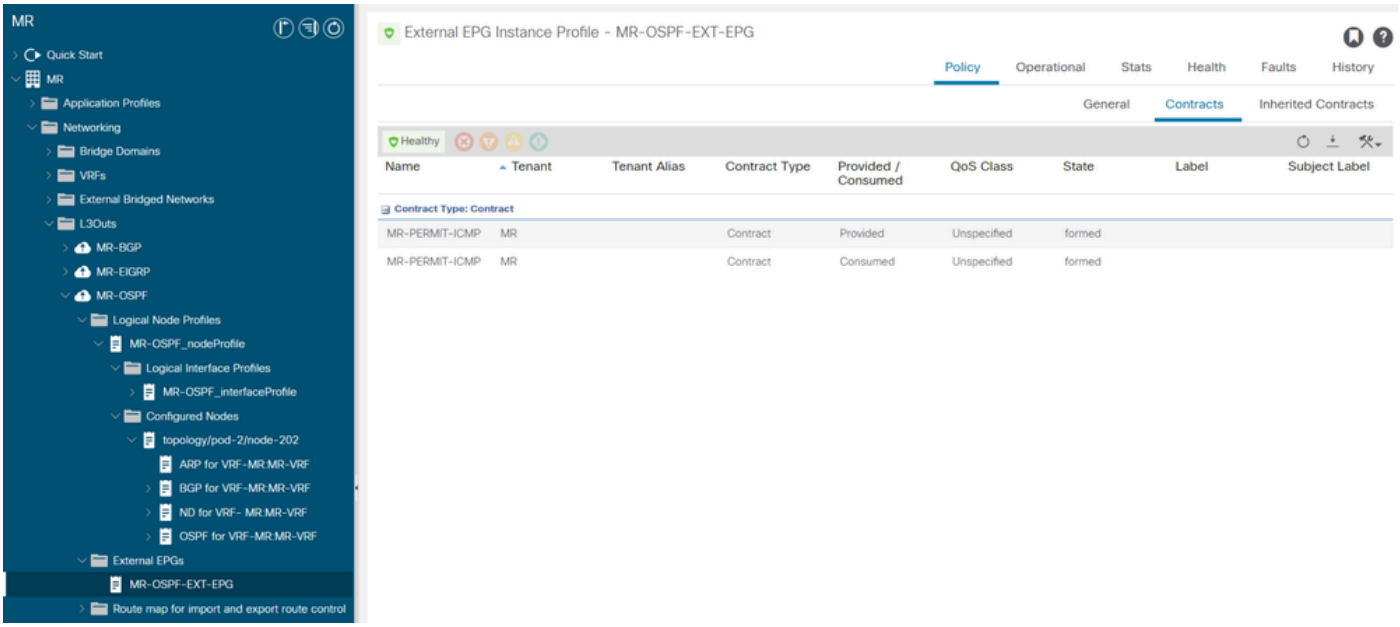


MR-OSPF L3Out的外部EPG例項配置檔案

在這些示例中， MR-PERMIT-ICMP合約在外部EPG中同時作為提供合約和消費合約應用。

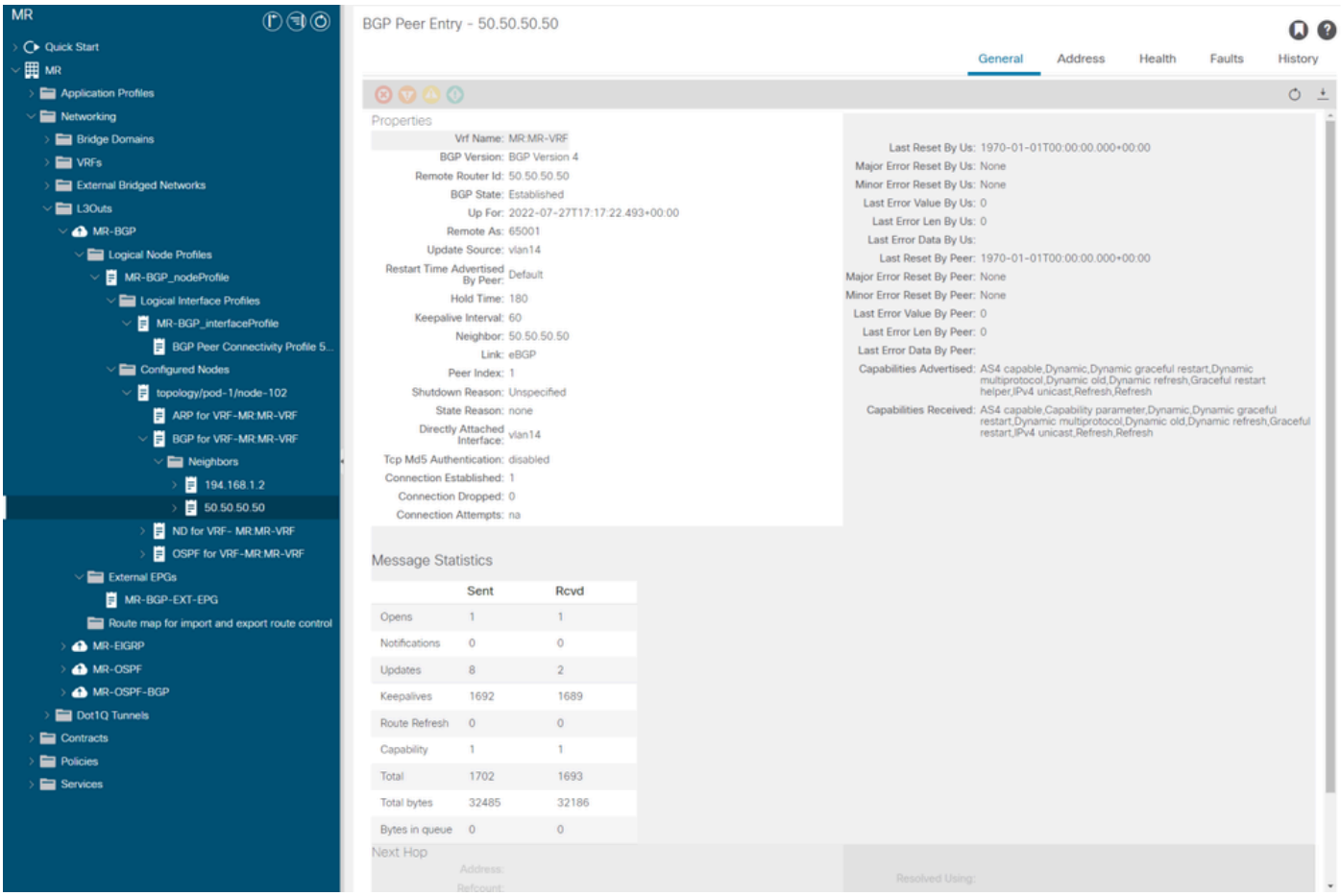


MR-PERMIT-ICMP合約適用於MR-BGP-EXT-EPG



MR-PERMIT-ICMP合約適用於MR-OSPF-EXT-EPG

於 LEAF102,BGP與鄰居建立 50.50.50.50 正在接收外部網路 49.49.49.49/32.



LEAF102上的BGP對等項

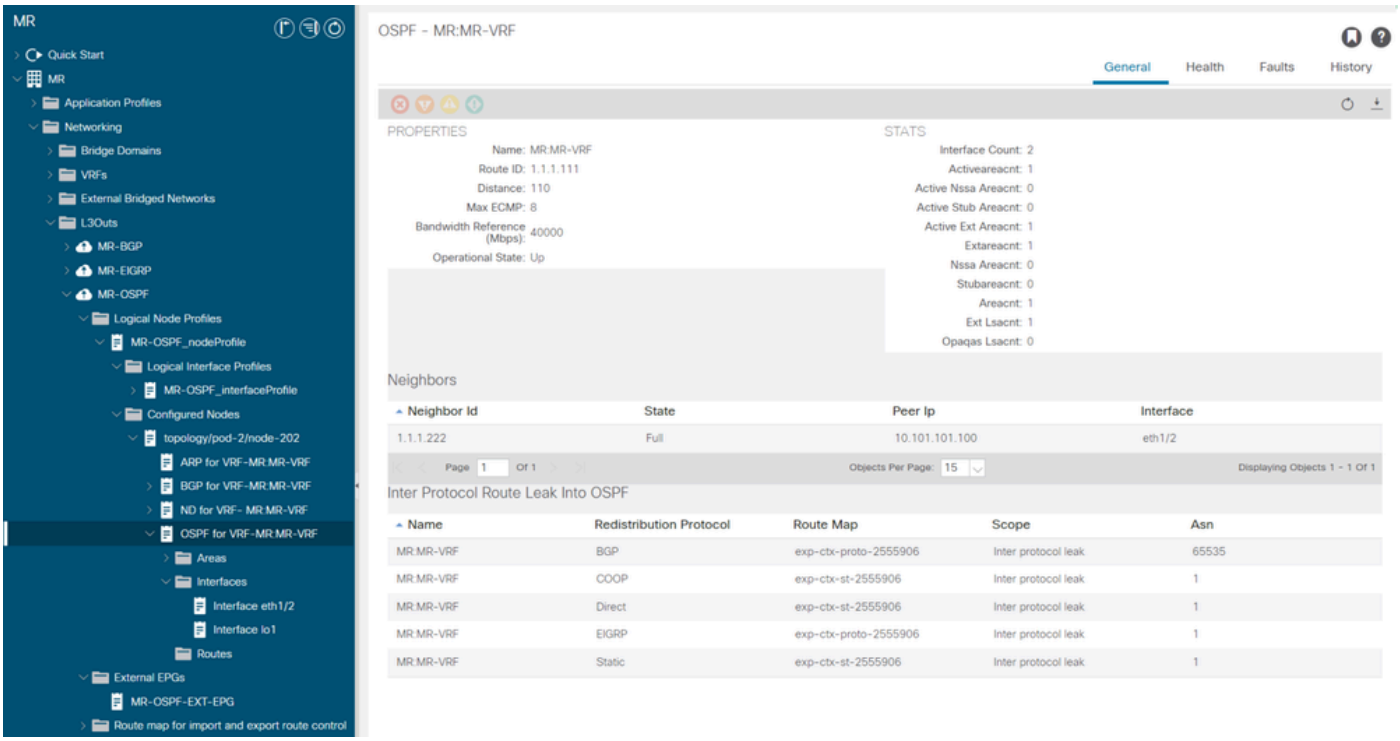
```
LEAF102# show ip bgp summary vrf MR:MR-VRF
BGP summary information for VRF MR:MR-VRF, address family IPv4 Unicast
BGP router identifier 50.50.50.55, local AS number 65535
BGP table version is 37, IPv4 Unicast config peers 4, capable peers 2
14 network entries and 16 paths using 1952 bytes of memory
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

於 LEAF202,OSPF與鄰居建立 1.1.1.222 正在接收外部網路 101.101.101.101/32.



LEAF202上的OSPF鄰居條目

```
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鄰居

```
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

兩者 LEAF102 和 LEAF202中，VRF的MP-BGP表顯示外部BGP網路， 49.49.49.49/32，但它顯示為外部的 LEAF102 和內部 LEAF202.OSPF外部網路、 101.101.101.101/32也出現在兩台枝葉交換機的BGP表中；開啟 LEAF202 它顯示為redistributed from OSPF and on LEAF102 它顯示為內部。

```
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 ?
```

適用於LEAF102上的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 ?
```

適用於LEAF202上VRF MR:MR-VRF的MP-BGP表

BGP IPv4表包含等效資訊。

```
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 ?
```

適用於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 ?
```

適用於LEAF202上VRF MR:MR-VRF的BGP IPv4表

但是，OSPF外部網路、 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
```

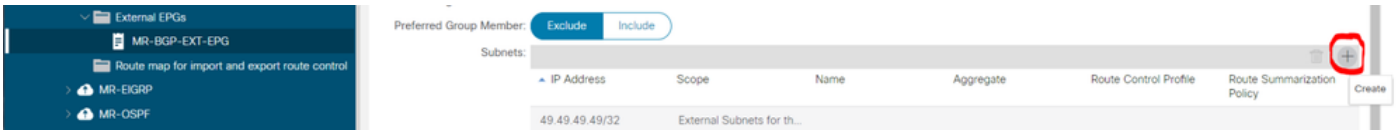
用於N5K1上的VRF MR-BGP的RIB

同樣，BGP外部網路， 49.49.49.49/32，不在 N5K2 肋骨。

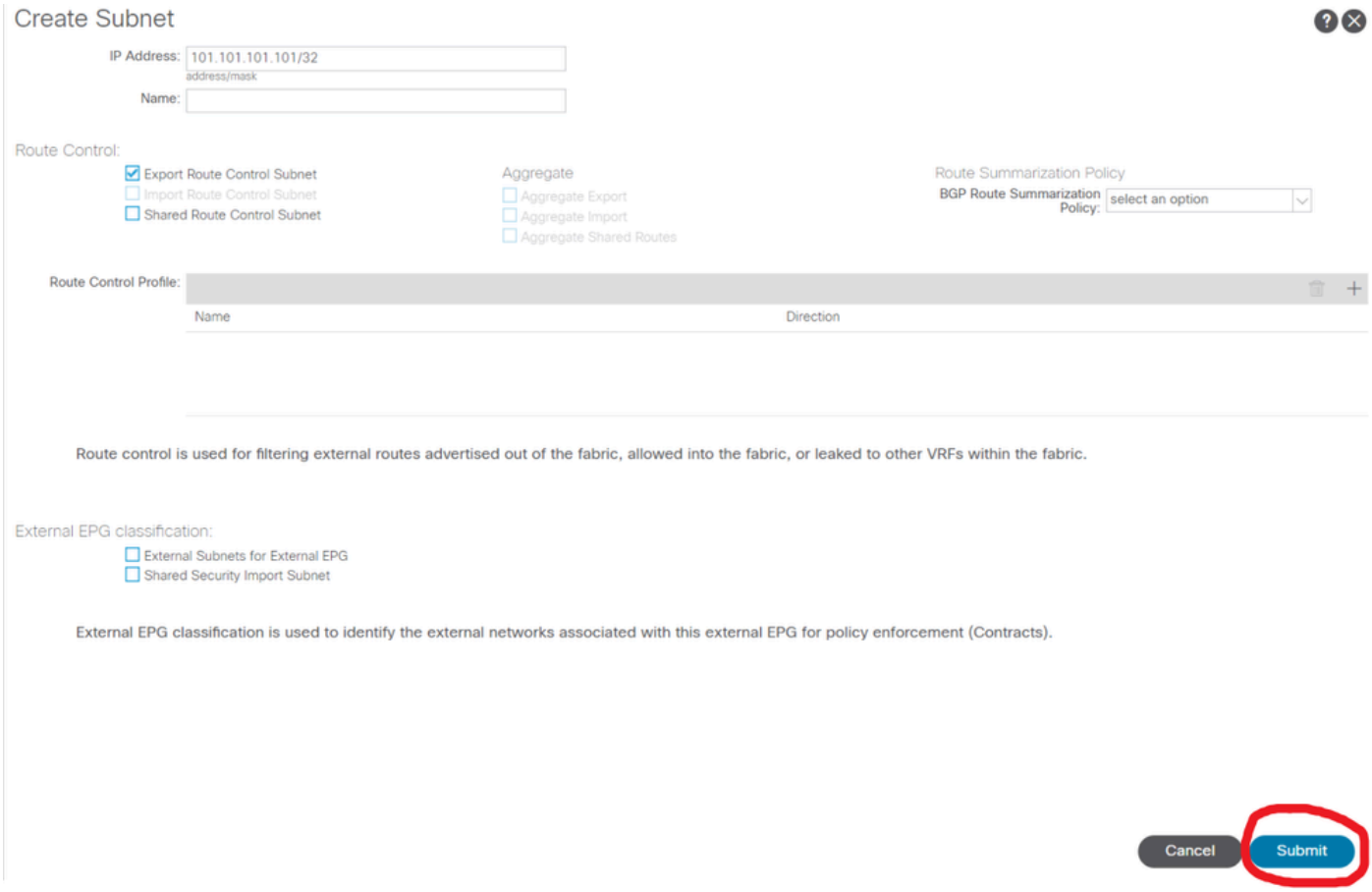
```
N5K2# show ip route vrf MR-OSPF
IP Route Table for VRF "MR-OSPF"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

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
```

用於N5K2上的VRF MR-OSPF的RIB

在BGP L3Out中，導航至 External EPGs > External EPG > Subnets 並選擇 + 圖示。輸入從OSPF L3Out接收的外部子網的IP地址。 101.101.101.101/32. 選擇 Export Route Control Subnet 在 Route Control 分割槽並清除 External Subnets for the External EPG 分類。按一下 Submit.其 Export Route Control Subnet 選項允許將網路匯出（通告）到外部對等體。



建立新子網



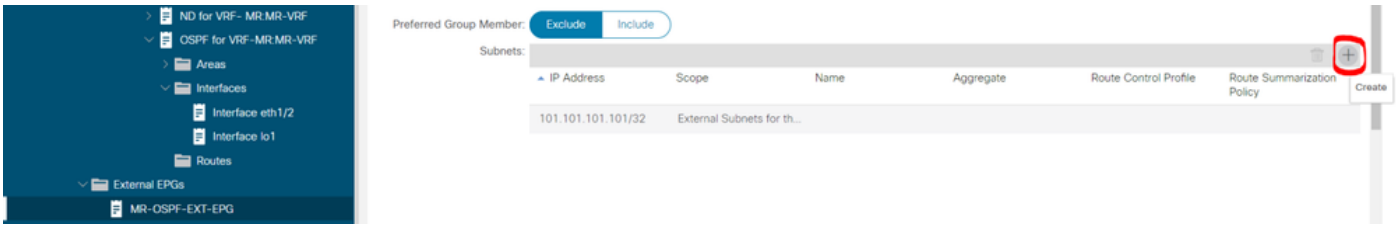
為新子網配置正確的選項

於 N5K1,OSPF外部網路， 101.101.101.101/32，現在通過BGP接收。

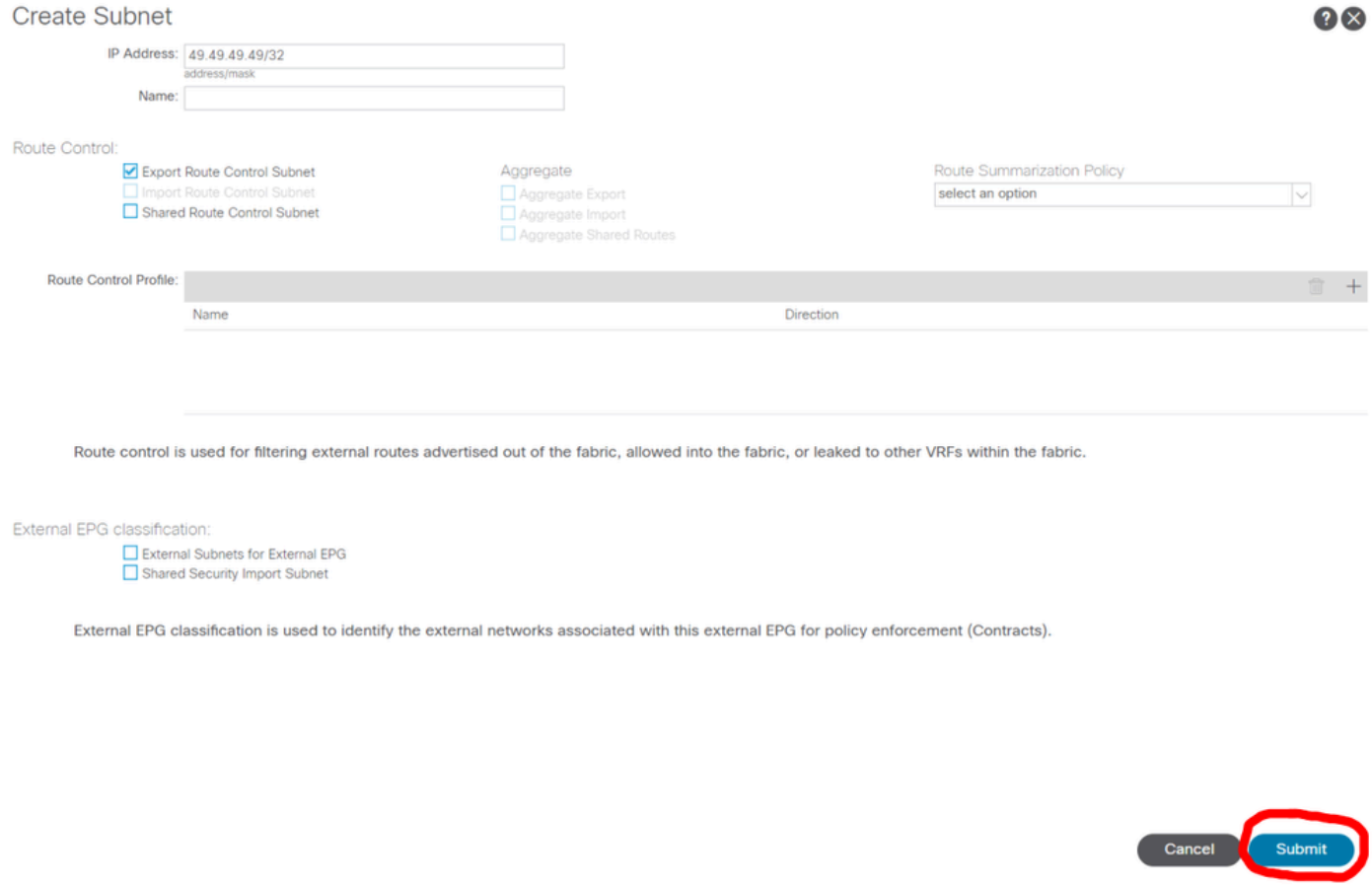
```
N5K1# show ip route vrf MR-BGP
IP Route Table for VRF "MR-BGP"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

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,
```

用於N5K1上的VRF MR-BGP的RIB

在OSPF L3Out中，導航至 External EPGs > External EPG > Subnets 並選擇 + 圖示。輸入從BGP L3Out接收的外部子網的IP地址。 49.49.49.49/32. 選擇 Export Route Control Subnet 在 Route Control 剖分並清除 External Subnets for the External EPG 分類。按一下 Submit.



建立新子網



為新子網配置正確的選項

現在開始 N5K2,BGP外部網路， 49.49.49.49/32通過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
```

用於N5K2上的VRF MR-OSPF的RIB

Ping可在兩個網路之間運作，因為 MR-PERMIT-ICMP 之前應用於兩個外部EPG的合約。

```
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上的通訊驗證

```
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通訊驗證

相關資訊

- 思科APIC第3層網路配置指南6.0(x)版
- 思科以應用程式為中心的基礎架構基礎知識版本4.2(x)
- 思科APIC第3層網路配置指南3.x版及更低版本
- 思科技術支援與下載

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）。