

在Nexus 9000中实施VxLAN/EVPN到MPLS/SR切换

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简介

本文档介绍如何在Cisco Nexus 9000系列交换机上配置分段路由MPLS切换的VxLAN EVPN。

先决条件

要求

Cisco 建议您了解以下主题：

- MPLS 第 3 层 VPN
- MP-BGP
- 分段路由

使用的组件

本文档中的信息基于以下软件和硬件版本：

- BL // N9K-C93240YC-FX2 // 9.3(3)
- ASR1K // 16.12.02
- 主干-1 // N9K-C92160YC-X // 9.2(3)
- PE // N9K-C93240YC-FX2 // 9.3(3)

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

数据中心(DC)部署采用VXLAN EVPN，其优势包括EVPN控制平面学习、多租户、无缝移动、冗余和更简单的POD添加。同样，CORE是基于标签分发协议(LDP)的MPLS L3VPN网络，或从基于传统MPLS L3VPN LDP的底层过渡到更复杂的解决方案，如分段路由(SR)。

网段路由是一种基于源路由模式在网络上转发数据包的方法。源设备选择路径并将其编码在数据包报头中，作为有序的数据段列表。数据段是任何类型指令的标识符。

SR的优势

网段路由的优点包括：

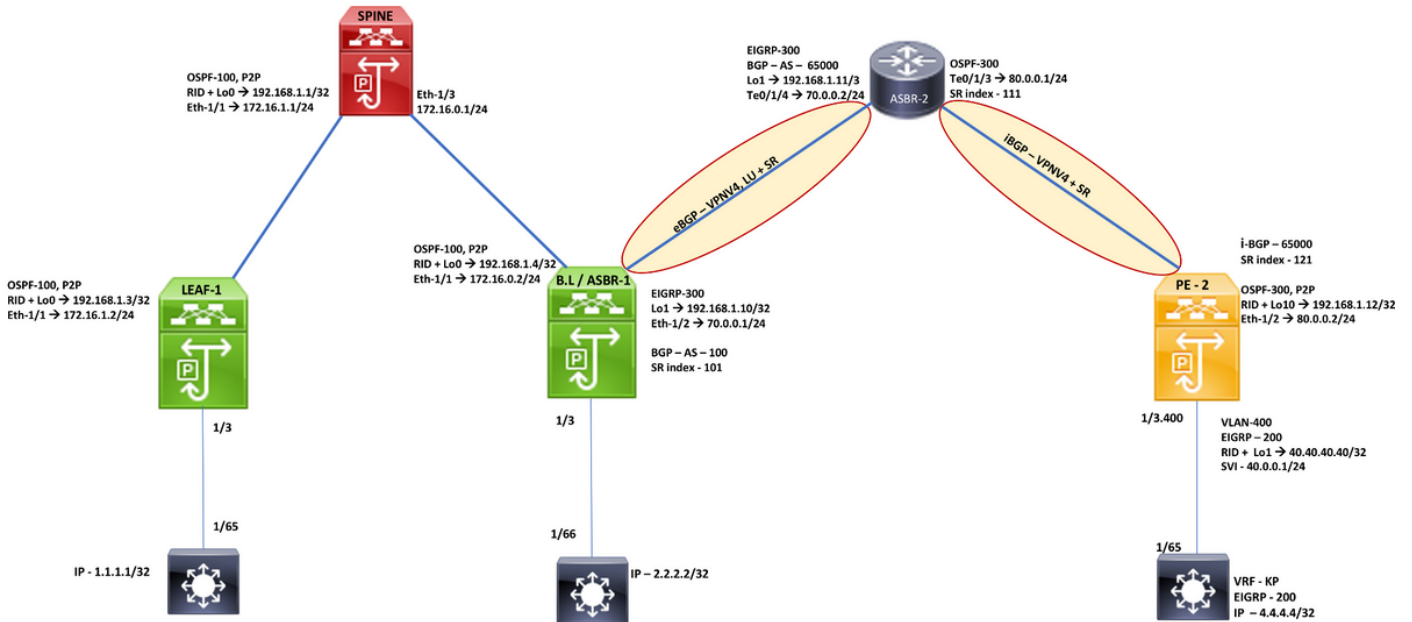
- 统一IGP MPLS控制平面。
- SDN就绪：网段路由是为SDN构建的，是应用工程路由(AER)的基础。SR为业务模式准备网络，在该模式下，应用可以引导网络行为。SR在分布式智能与集中优化和编程之间提供了恰当的平衡。
- 配置最低:TE的网段路由要求源路由器上的配置最少。
- 负载均衡：与RSVP-TE不同，网段路由的负载均衡可以在等价多路径(ECMP)存在时进行。
- 支持快速重路由(FRR):快速重新路由可在路径故障50毫秒内激活预配置的备份路径。
- 即插即用部署：分段路由策略可与现有MPLS控制和数据平面互操作，并可在现有部署中实施。

配置EVPN与L3VPN(MPLS SR)无缝集成的准则和限制

| 功能 | 思科Nexus 9300-FX2交换机 | 带 — R线卡的Cisco Nexus 9504和9508交换机 | 备注 |
|----------------------------|---------------------|----------------------------------|---|
| VXLAN EVPN到SR-L3VPN | Yes | Yes | 通过SR扩展扩展不同DC Pod底层IGP/BGP的第3层连接。 |
| VXLAN EVPN到SR-L3VPN | Yes | Yes | 扩展运行VXLAN的DC POD与运行SR的任 (DC或CORE) 之间的第3层连接。 |
| VXLAN EVPN到MPLS L3VPN(LDP) | 无 | Yes | 底层是LDP。 |

配置

网络图



配置

Border Leaf - ASBR1 Configuration

```
hostname BL
install feature-set mpls
allow feature-set mpls
feature-set mpls
nv overlay evpn
feature ospf
feature bgp
feature pim
feature eigrp
feature mpls l3vpn
feature mpls segment-routing
feature interface-vlan
feature vn-segment-vlan-based
feature lldp
feature mpls oam
feature nv overlay

ip pim rp-address 192.168.1.1 group-list 224.0.0.0/4
ip pim ssm range 232.0.0.0/8
mpls label range 5000 450000

segment-routing
mpls
global-block 16000 25000
connected-prefix-sid-map
address-family ipv4
192.168.1.10/32 index 100

ip prefix-list adveig seq 5 permit 2.2.2.2/32
ip prefix-list localsub seq 5 permit 30.0.0.0/24
ip prefix-list localsub seq 10 permit 30.30.30.30/32
ip prefix-list localsub seq 15 permit 192.168.1.10/32
ip prefix-list localsub seq 20 permit 70.0.0.0/24

route-map direct permit 10
match ip address prefix-list localsub
route-map eig permit 10
match ip address prefix-list adveig
route-map lbgpout permit 10
match route-type external internal
route-map label-index-Leaf2 permit 10
set label-index 101
```

```
vlan 1,200,300
vlan 200
vn-segment 201
vlan 300
vn-segment 5000

interface Vlan200
no shutdown
vrf member KP
ip address 30.0.0.1/24
ip router eigrp 200

interface Vlan201

interface Vlan300
no shutdown
vrf member KP
ip forward

vrf context KP
vni 5000
ip pim rp-address 192.168.1.1 group-list 224.0.0.0/4
rd auto
address-family ipv4 unicast
route-target import 65000:1
route-target export 65000:1
route-target both auto
route-target both auto evpn

interface vne1
no shutdown
host-reachability protocol bgp
suppress mac-route
source-interface loopback0
member vni 201
mcast-group 239.0.0.1
member vni 5000 associate-vrf
```

```
interface loopback0
ip address 192.168.1.4/32
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode

interface loopback1
ip address 192.168.1.10/32
ip router eigrp 300

interface loopback10
vrf member KP
ip address 30.30.30.30/32
ip router eigrp 200

interface Ethernet1/1
ip address 172.16.0.2/24
ip ospf network point-to-point
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
no shutdown

interface Ethernet1/2
mtu 9216
ip address 70.0.0.1/24
ip router eigrp 300
mpls ip forwarding
no shutdown

interface Ethernet1/3
switchport
switchport mode trunk
switchport trunk allowed vlan 200-201,300
no shutdown

router eigrp 200
router-id 30.30.30.30
vrf KP
address-family ipv4 unicast
redistribute bgp 100 route-map lbgpout
router eigrp 300
router-id 192.168.1.10
router ospf 100
router-id 192.168.1.4
```

```
router bgp 100
router-id 192.168.1.4
address-family ipv4 unicast
network 192.168.1.10/32 route-map label-index-Leaf2
redistribute direct route-map direct
allocate-label all
address-family ipv6 unicast
address-family vpnv4 unicast
address-family ipv4 labeled-unicast
address-family l2vpn evpn
neighbor 70.0.0.2
remote-as 65000
ebgp-multihop 10
address-family ipv4 labeled-unicast
send-community
send-community extended
neighbor 192.168.1.1
remote-as 100
update-source loopback0
address-family ipv4 unicast
send-community extended
address-family l2vpn evpn
send-community extended
import vpn unicast reoriginate

neighbor 192.168.1.11
remote-as 65000
update-source loopback1
disable-connected-check
ebgp-multihop 10
address-family vpnv4 unicast
send-community extended
import l2vpn evpn reoriginate
address-family l2vpn evpn
send-community extended
rewrite-evpn-rt-asn

vrf KP
address-family ipv4 unicast
redistribute direct route-map direct
redistribute eigrp 200 route-map eig
```

ASR1K - ASBR2 Configuration

```
hostname P-Router
interface Loopback0
ip address 192.168.1.11 255.255.255.255
!
!
segment-routing mpls
global-block 16000 25000
!
connected-prefix-sid-map
address-family ipv4
192.168.1.11/32 index 111 range 1
exit-address-family
!
```

```
!
interface TenGigabitEthernet0/1/3
ip address 80.0.0.1 255.255.255.0
ip ospf network point-to-point
cdp enable
mpls ip
!
router ospf 300
router-id 192.168.1.11
segment-routing area 0 mpls
segment-routing mpls
segment-routing prefix-sid-map advertise-local
redistribute connected
redistribute static
redistribute bgp 65000
network 80.0.0.0 0.0.0.255 area 0
network 192.168.1.11 0.0.0.0 area 0
!
!
router eigrp 300
network 70.0.0.0 0.0.0.255
network 192.168.1.11 0.0.0.0
eigrp router-id 192.168.1.11
!
!
interface TenGigabitEthernet0/1/4
mtu 9216
ip address 70.0.0.2 255.255.255.0
ip ospf network point-to-point
cdp enable
mpls ip
mpls bgp forwarding
!
```

```
!
router bgp 65000
bgp router-id 192.168.1.11
no bgp transport path-mtu-discovery
bgp log-neighbor-changes
no bgp default route-target filter
neighbor 70.0.0.1 remote-as 100
neighbor 70.0.0.1 ebgp-multihop 10
neighbor 192.168.1.10 remote-as 100
neighbor 192.168.1.10 ebgp-multihop 10
neighbor 192.168.1.10 disable-connected-check
neighbor 192.168.1.10 update-source Loopback0
neighbor 192.168.1.12 remote-as 65000
neighbor 192.168.1.12 update-source Loopback0
!
address-family ipv4
redistribute connected
redistribute ospf 300
segment-routing mpls
neighbor 70.0.0.1 activate
neighbor 70.0.0.1 send-community both
neighbor 70.0.0.1 send-label
neighbor 192.168.1.10 activate
neighbor 192.168.1.10 send-community both
neighbor 192.168.1.10 soft-reconfiguration inbound
neighbor 192.168.1.10 send-label
no neighbor 192.168.1.12 activate
exit-address-family
!
address-family vpnv4
neighbor 192.168.1.10 activate
neighbor 192.168.1.10 send-community both
neighbor 192.168.1.12 activate
neighbor 192.168.1.12 send-community both
neighbor 192.168.1.12 next-hop-self
exit-address-family
!
address-family l2vpn evpn
exit-address-family
!
```

Far-End PE2 Configuration

```
hostname PE2
install feature-set mpls
allow feature-set mpls
feature-set mpls
feature ospf
feature bgp
feature eigrp
feature mpls l3vpn
feature mpls segment-routing
feature interface-vlan
feature lldp
feature mpls oam

vlan 1400
segment-routing
mpls
global-block 16000 25000
connected-prefix-sid-map
address-family ipv4
192.168.1.12/32 index 121

ip prefix-list adveig seq 5 permit 4.4.4.4/32
ip prefix-list localsub seq 5 permit 40.0.0.0/24
ip prefix-list localsub seq 10 permit 40.40.40.40/32
route-map direct permit 10
match ip address prefix-list localsub
route-map eig permit 10
match ip address prefix-list adveig
route-map ibgpout permit 10
match tag 100
match route-type internal

route-map label-index-Leaf2 permit 10
set label-index 121

vrf context KP
rd auto
address-family ipv4 unicast
route-target import 100:5000
route-target import 65000:1
route-target export 100:5000
route-target export 65000:1
```

```
interface Ethernet1/2
ip address 80.0.0.2/24
ip ospf network point-to-point
ip router ospf 300 area 0.0.0.0
mpls ip forwarding
no shutdown

interface loopback10
ip address 192.168.1.12/32
ip router ospf 300 area 0.0.0.0

router ospf 300
segment-routing mpls
router-id 192.168.1.12
distance 115

interface Ethernet1/3
switchport
switchport mode trunk
switchport trunk allowed vlan 400
no shutdown

interface Vlan400
no shutdown
vrf member KP
ip address 40.0.0.1/24
ip router eigrp 200

interface loopback1
vrf member KP
ip address 40.40.40.40/32
ip router eigrp 200
```

```
router bgp 65000
router-id 192.168.1.12
address-family ipv4 unicast
network 192.168.1.12/32 route-map label-index-Leaf2
redistribute direct route-map direct
redistribute eigrp 200 route-map eig
allocate-label all
address-family vpnv4 unicast
address-family ipv4 labeled-unicast
neighbor 192.168.1.11
remote-as 65000
update-source loopback10
address-family vpnv4 unicast
send-community extended
vrf KP
address-family ipv4 unicast
redistribute direct route-map direct
redistribute eigrp 200 route-map eig
```

验证

Host-1 & Leaf-1 Verification

host1# sh ip int br | ex down

```
IP Interface Status for VRF "default"(1)
Interface IP Address Interface Status
Vlan201 20.0.0.2 protocol-up/link-up/admin-up
Lo0 1.1.1.1 protocol-up/link-up/admin-up
```

host1# traceroute 4.4.4.4 source 1.1.1.1

```
traceroute to 4.4.4.4 (4.4.4.4) from 1.1.1.1 (1.1.1.1), 30 hops max, 40 byte packets
 1 20.0.0.1 (20.0.0.1) 0.92 ms 0.531 ms 0.513 ms
 2 30.0.0.1 (30.0.0.1) 1.043 ms 0.819 ms 0.733 ms
 3 40.0.0.1 (40.0.0.1) 0.912 ms 0.673 ms 0.624 ms
 [Label=492287 E=0 TTL=253 S=1]
 4 4.4.4.4 (4.4.4.4) 0.882 ms 0.825 ms 0.561 ms
host1#
```

Leaf1_N3k# show bgp l2vpn evpn

BGP routing table information for VRF default, address family L2VPN EVPN
 BGP table version is 42, Local Router ID is 192.168.1.3
 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, l-injected
 Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2

| Network | Next Hop | Metric | LocPrf | Weight | Path |
|---------------------------------------|-------------|--------|--------|--------|------|
| Route Distinguisher: 192.168.1.4:3 | | | | | |
| *>i[5]:[0]:[0]:[24]:[30.0.0.0]/224 | 192.168.1.4 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[24]:[40.0.0.0]/224 | 192.168.1.4 | 100 | 0 | 65000 | ? |
| *>i[5]:[0]:[0]:[32]:[2.2.2.2]/224 | 192.168.1.4 | 130816 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[4.4.4.4]/224 | 192.168.1.4 | 100 | 0 | 65000 | ? |
| *>i[5]:[0]:[0]:[32]:[30.30.30.30]/224 | 192.168.1.4 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[40.40.40.40]/224 | 192.168.1.4 | 100 | 0 | 65000 | ? |

| | | | | | |
|---|-------------|--------|-----|-------|---|
| Route Distinguisher: 192.168.1.3:3 (L3VNI 5000) | | | | | |
| *>i[5]:[0]:[0]:[24]:[20.0.0.0]/224 | 192.168.1.3 | 0 | 100 | 32768 | ? |
| *>i[5]:[0]:[0]:[24]:[30.0.0.0]/224 | 192.168.1.4 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[24]:[40.0.0.0]/224 | 192.168.1.4 | 100 | 0 | 65000 | ? |
| *>i[5]:[0]:[0]:[32]:[1.1.1.1]/224 | 192.168.1.3 | 130816 | 100 | 32768 | ? |
| *>i[5]:[0]:[0]:[32]:[2.2.2.2]/224 | 192.168.1.4 | 130816 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[4.4.4.4]/224 | 192.168.1.4 | 100 | 0 | 65000 | ? |
| *>i[5]:[0]:[0]:[32]:[20.20.20.20]/224 | 192.168.1.3 | 0 | 100 | 32768 | ? |
| *>i[5]:[0]:[0]:[32]:[30.30.30.30]/224 | 192.168.1.4 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[40.40.40.40]/224 | 192.168.1.4 | 100 | 0 | 65000 | ? |

Leaf1_N3k#

Border Leaf Verification

BL# sh bgp l2vpn evpn

BGP routing table information for VRF default, address family L2VPN EVPN
 BGP table version is 30, Local Router ID is 192.168.1.4
 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, l-injected
 Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2

| Network | Next Hop | Metric | LocPrf | Weight | Path |
|---|-------------|--------|--------|--------|------|
| Route Distinguisher: 192.168.1.3:3 | | | | | |
| *>i[5]:[0]:[0]:[24]:[20.0.0.0]/224 | 192.168.1.3 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[1.1.1.1]/224 | 192.168.1.3 | 130816 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[20.20.20.20]/224 | 192.168.1.3 | 0 | 100 | 0 | ? |
| Route Distinguisher: 192.168.1.4:3 (L3VNI 5000) | | | | | |
| *>i[5]:[0]:[0]:[24]:[20.0.0.0]/224 | 192.168.1.3 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[24]:[30.0.0.0]/224 | 192.168.1.4 | 0 | 100 | 32768 | ? |
| *>i[5]:[0]:[0]:[24]:[40.0.0.0]/224 | 192.168.1.4 | 0 | 65000 | ? | ? |
| *>i[5]:[0]:[0]:[32]:[1.1.1.1]/224 | 192.168.1.3 | 130816 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[2.2.2.2]/224 | 192.168.1.4 | 130816 | 100 | 32768 | ? |
| *>i[5]:[0]:[0]:[32]:[4.4.4.4]/224 | 192.168.1.4 | 0 | 65000 | ? | ? |
| *>i[5]:[0]:[0]:[32]:[20.20.20.20]/224 | 192.168.1.3 | 0 | 100 | 0 | ? |
| *>i[5]:[0]:[0]:[32]:[30.30.30.30]/224 | 192.168.1.4 | 0 | 100 | 32768 | ? |
| *>i[5]:[0]:[0]:[32]:[40.40.40.40]/224 | 192.168.1.4 | 0 | 65000 | ? | ? |

BL#

BL# show bgp vpnv4 unicast

BGP routing table information for VRF default, address family VPNv4 Unicast
 BGP table version is 81, Local Router ID is 192.168.1.4
 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, l-injected
 Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2

| Network | Next Hop | Metric | LocPrf | Weight | Path |
|---|--------------|--------|--------|--------|------|
| Route Distinguisher: 192.168.1.4:3 (VRF KP) | | | | | |
| *>i1.1.1.1/32 | 192.168.1.3 | 130816 | 100 | 0 | ? |
| *>2.2.2.2/32 | 0.0.0.0 | 130816 | 100 | 32768 | ? |
| *>e4.4.4.4/32 | 192.168.1.11 | 0 | 65000 | ? | ? |
| *>20.0.0.0/24 | 192.168.1.3 | 0 | 100 | 0 | ? |
| *>30.0.0.0/24 | 192.168.1.3 | 0 | 100 | 0 | ? |
| *>30.0.0.0/24 | 0.0.0.0 | 0 | 100 | 32768 | ? |
| *>30.30.30.30/32 | 0.0.0.0 | 0 | 100 | 32768 | ? |
| *>e40.0.0.0/24 | 192.168.1.11 | 0 | 65000 | ? | ? |
| *>e40.40.40.40/32 | 192.168.1.11 | 0 | 65000 | ? | ? |
| Route Distinguisher: 192.168.1.12:3 | | | | | |
| *>e4.4.4.4/32 | 192.168.1.11 | 0 | 65000 | ? | ? |
| *>e40.0.0.0/24 | 192.168.1.11 | 0 | 65000 | ? | ? |
| *>e40.40.40.40/32 | 192.168.1.11 | 0 | 65000 | ? | ? |

BL#

BL# show segment-routing mpls clients

Segment-Routing Mpls Client Info

Client: bgp-100
 PIB Index: 1 UUID: 0x11b PID: 4611 MTS SAP: 7255
 TIBs registered:
 VRF: default Table: base
 Total Clients: 1
 BL# show segment-routing mpls ipv4 connected-prefix-sid-map
 Segment-Routing Mpls Prefix-SID Mappings
 Prefix-SID mappings for VRF default Table base

| Prefix | SID | Type | Range | SRGB |
|-----------------|-----|------|-------|------|
| 192.168.1.10/32 | 100 | Indx | 1 | Y |

*SRGB - Indicates whether Prefix-Sid is within configured SRGB
 BL#

BL# show segment-routing mpls detail

Segment-Routing Mpls Global Info
 Service Name: segment-routing
 State: Enabled
 Process ID: 2505
 Configured SRGB: 16000 - 25000
 SRGB Allocation status: Alloc-Successful
 Current SRGB: 16000 - 25000
 Cleanup Interval: 60
 Retry Interval: 180
 SRGB ULIB handle: 4096002
 ULIB RegStatus: Done
 ULIB PIB handle: 0x2
 BL#

BL# show mpls switching

Legend:
 (P)=Protected, (F)=FRR active, (*)=more labels in stack

| IPv4: | In-Label | Out-Label | FEC name | Out-Interface | Next-Hop |
|--|---------------|-----------------|----------|---------------|----------|
| VRF default | | | | | |
| 5000 | Pop Label | 80.0.0.0/24 | Eth1/2 | | 70.0.0.2 |
| 16111 | Pop Label | 192.168.1.11/32 | Eth1/2 | | 70.0.0.2 |
| 16121 | 16121 | 192.168.1.12/32 | Eth1/2 | | 70.0.0.2 |
| In-Label VRF | | | | | |
| 492288 default | | | | | |
| 492287 KP | | | | | |
| Local Out-Label Out-Interface Next-Hop | | | | | |
| FEC: 4.4.4.4/32, 192.168.1.12:3 | | | | | |
| 5001 | 22 | | | 192.168.1.11 | |
| FEC: 40.0.0.0/24, 192.168.1.12:3 | | | | | |
| 5002 | 23 | | | 192.168.1.11 | |
| FEC: 40.40.40.40/32, 192.168.1.12:3 | | | | | |
| 5003 | 24 | | | 192.168.1.11 | |
| Block Label-Range | | | | | |
| 1 | 16000 - 25000 | | | | |
| BL# | | | | | |


```
P-Router#sh ip inter bri | ex down
Interface IP-Address OK? Method Status Protocol
Te0/1/2 unassigned YES NVRAM up up
Te0/1/3 80.0.0.1 YES NVRAM up up
Te0/1/4 70.0.0.2 YES NVRAM up up
GigabitEthernet0 10.82.139.101 YES manual up up
Loopback0 192.168.1.11 YES NVRAM up up
```

```
P-Router#show ip ospf neighbor
Neighbor ID Pri State Dead Time Address Interface
192.168.1.12 0 FULL/ - 00:00:35 80.0.0.2 TenGigabitEthernet0/1/3
P-Router#
```

```
P-Router#show bgp vpnv4 unicast all
BGP table version is 28, local router ID is 192.168.1.11
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,
t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

Network Next Hop Metric LocPrf Weight Path
Route Distinguisher: 192.168.1.4:3
*> 1.1.1.1/32 192.168.1.10 0 100 ?
*> 2.2.2.2/32 192.168.1.10 130816 0 100 ?
*> 20.0.0.0/24 192.168.1.10 0 100 ?
*> 20.20.20.0/32 192.168.1.10 0 100 ?
*> 30.0.0.0/24 192.168.1.10 0 0 100 ?
*> 30.30.30.0/32 192.168.1.10 0 0 100 ?
Route Distinguisher: 192.168.1.12:3
*> 4.4.4.4/32 192.168.1.12 130816 100 0 ?
*> 40.0.0.0/24 192.168.1.12 0 100 0 ?
*> 40.40.40.0/32 192.168.1.12 0 100 0 ?
P-Router#
```

```
P-Router#show segment-routing mpls state
Segment Routing MPLS State : ENABLED

P-Router#
```

P-Router Verification

```
P-Router#show mpls forwarding-table
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
16 Pop Label 80.0.0.2-A 0 Te0/1/3 80.0.0.2
17 [M] Pop Label 192.168.1.12/32 0 Te0/1/3 80.0.0.2
18 Pop Label 192.168.1.10/32 0 Te0/1/4 70.0.0.1
19 492287 192.168.1.4:3:2.2.2.2/32 \
0 Te0/1/4 70.0.0.1
20 492287 192.168.1.4:3:30.0.0.0/24 \
510 Te0/1/4 70.0.0.1
21 492287 192.168.1.4:3:30.30.30.0/32 \
0 Te0/1/4 70.0.0.1
22 492287 192.168.1.12:3:4.4.4.4/32 \
2828 Te0/1/3 80.0.0.2
23 492287 192.168.1.12:3:40.0.0.0/24 \
9774 Te0/1/3 80.0.0.2
24 492287 192.168.1.12:3:40.40.40.0/32 \
1848 Te0/1/3 80.0.0.2
25 492287 192.168.1.4:3:1.1.1.1/32 \
5082 Te0/1/4 70.0.0.1
26 492287 192.168.1.4:3:20.0.0/24 \
780 Te0/1/4 70.0.0.1
27 492287 192.168.1.4:3:20.20.20.0/32 \
P-Router#
```

```
P-Router#show segment-routing client all
SRHandle: 1 ClientType: SR INTERNAL ClientHandle: 0
SRHandle: 2 ClientType: OSPF ClientHandle: 7FB45A5B94C8
Registered Notifications:
Handle: 0x0 topoid(0) sidmap_bitmask(1) algo(0)
Handle: 0x1 topoid(0) sidmap_bitmask(1) algo(1)
Handle: 0x2 topoid(0) sidmap_bitmask(2) algo(0)
Handle: 0x3 topoid(0) sidmap_bitmask(2) algo(1)
Handle: 0x4 topoid(0) sidmap_bitmask(E) algo(0) Expanded
Handle: 0x5 topoid(0) sidmap_bitmask(E) algo(1) Expanded
P-Router#
```

```
SRHandle: 3 ClientType: BGP ClientHandle: 7FB45A5DF9A8
Registered Notifications:
Handle: 0x6 topoid(0) sidmap_bitmask(8) algo(0)
Handle: 0x7 topoid(0) sidmap_bitmask(1) algo(0)
P-Router#
```

```
P-Router#show segment-routing mpls connected-prefix-sid-map protocol ipv4
```

```
PREFIX_SID_PROTOCOL_ADV_MAP_ALGO_0
Prefix/masklen SID Type Range Flags SRGB Source
192.168.1.10/32 100 Indx 1 Y BGP 192.168.1.4
192.168.1.11/32 111 Indx 1 Y OSPF Area 0 192.168.1.11
192.168.1.12/32 121 Indx 1 Y OSPF Area 0 192.168.1.12
P-Router#
```

```
P-Router#show mpls forwarding-table 192.168.1.12 32
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
17 [M] Pop Label 192.168.1.12/32 0 Te0/1/3 80.0.0.2
16121 [M] Pop Label 192.168.1.12/32 0 Te0/1/3 80.0.0.2
P-Router#
```

```
P-Router#sh mpls forwarding-table 192.168.1.10 32
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
18 Pop Label 192.168.1.10/32 0 Te0/1/4 70.0.0.1
16100 Pop Label 192.168.1.10/32 0 Te0/1/4 70.0.0.1
P-Router#show mpls forwarding-table labels 16
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
16 Pop Label 80.0.0.2-A 0 Te0/1/3 80.0.0.2
P-Router#
```

```
A - Adjacency SID
P-Router#show mpls forwarding-table labels 17
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
17 [M] Pop Label 192.168.1.12/32 0 Te0/1/3 80.0.0.2
P-Router#
```

```
[M] - Merged
P-Router#show mpls forwarding-table labels 18
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
18 Pop Label 192.168.1.10/32 0 Te0/1/4 70.0.0.1
P-Router#show mpls forwarding-table labels 22
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
22 492287 192.168.1.12:3:4.4.4.4/32 \
2828 Te0/1/3 80.0.0.2
P-Router#
```

Far-End PE Verification

```
PE2# show bgp vpnv4 unicast
BGP routing table information for VRF default, address family VPNv4 Unicast
BGP table version is 79, Local Router ID is 192.168.1.12
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-redest, i-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2

Network Next Hop Metric LocPrf Weight Path
Route Distinguisher: 192.168.1.4:3
*> 1.1.1.1/32 192.168.1.11 0 100 0 100 ?
*> 2.2.2.2/32 192.168.1.11 130816 100 0 100 ?
*> 20.0.0.0/24 192.168.1.11 0 100 0 100 ?
*> 20.20.20.0/32 192.168.1.11 0 100 0 100 ?
*> 30.0.0.0/24 192.168.1.11 0 100 0 100 ?
*> 30.30.30.0/32 192.168.1.11 0 100 0 100 ?
Route Distinguisher: 192.168.1.12:3 (VRF KP)
*> 1.1.1.1/32 192.168.1.11 0 100 0 100 ?
*> 2.2.2.2/32 192.168.1.11 130816 100 0 100 ?
*> 4.4.4.4/32 0.0.0.0 130816 100 32768 ?
*> 10.0.0.0/24 192.168.1.11 0 100 0 100 ?
*> 20.20.20.0/32 192.168.1.11 0 100 0 100 ?
*> 30.0.0.0/24 192.168.1.11 0 100 0 100 ?
*> 30.30.30.0/32 192.168.1.11 0 100 0 100 ?
*> 40.0.0.0/24 0.0.0.0 0 100 32768 ?
*> 40.40.40.0/32 0.0.0.0 0 100 32768 ?
PE2#
```

```
PE2# show ip interface brief | ex down
IP Interface Status for VRF "default"(1)
Interface IP Address Interface Status
Lo10 192.168.1.12 protocol-up/link-up/admin-up
Eth1/2 80.0.0.2 protocol-up/link-up/admin-up
PE2#
```

```
PE2# sh ip interface brief vrf KP | ex down
IP Interface Status for VRF "KP"(3)
Interface IP Address Interface Status
Vlan400 40.0.0.1 protocol-up/link-up/admin-up
Lo1 40.40.40.40 protocol-up/link-up/admin-up
PE2#
PE2# show ip ospf neighbors
OSPF Process ID 300 VRF default
Total number of neighbors: 1
Neighbor ID Pri State Up Time Address Interface
192.168.1.11 1 FULL/ - 06:48:03 80.0.0.1 Eth1/2
PE2#
```

```
PE2# show segment-routing mpls detail
Segment-Routing MPLS Global Info
Service Name: segment-routing
State: Enabled
Process ID: 2257
Configured SRGB: 16000 - 25000
SRGB Allocation status: Alloc-Successful
Current SRGB: 16000 - 25000
Cleanup Interval: 60
Retry Interval: 180
SRGB ULIB handle: 4096002
ULIB RegStatus: Done
ULIB PIB handle: 0x2
PE2#
PE2# show segment-routing mpls clients
Segment-Routing MPLS Client Info
Client: ospf-300
PIB Index: 1 UUID: 0x41000119 PID: 4281 MTS SAP: 320
TIBs registered:
VRF: default Table: base
Client: bgp-65000
PIB Index: 2 UUID: 0x11b PID: 4302 MTS SAP: 6825
TIBs registered:
VRF: default Table: base
Total Clients: 2
PE2#
```

```
PE2# show segment-routing mpls ipv4 connected-prefix-sid-map
Segment-Routing MPLS Prefix SID Mappings
Prefix-SID mappings for VRF default Table base
Prefix SID Type Range SRGB
192.168.1.12/32 121 Indx 1 Y
*SRGB - Indicates whether Prefix-Sid is within configured SRGB
PE2# sho forwarding mpls
slot 1
=====
Local |Prefix|FEC|Next-Hop|Interface|Out
Label|Table Id|(Prefix/Tunnel Id)||Label
-----|-----|-----|-----|-----|-----
16 |N/A|N/A||80.0.0.1|Eth1/2|Pop Label
16111 |0x1||192.168.1.11/32||80.0.0.1|Eth1/2|0 SWAP
492288 |||||Eth1/2|Pop Label
PE2#
```

```
PE2# show mpls switching
Legend:
(P)=Protected, (F)=FRR active, (*)=more labels in stack
IPv4:
In-Label Out-Label FEC name Out-Interface Next-Hop
VRF default:
16111 Pop Label 192.168.1.11/32 Eth1/2 80.0.0.1
In-Label VRF
492288 default
492287 KP
ADI_SID:
In-Label Out-Label FEC name Out-Interface Next-Hop
16 3 80.0.0.1 Eth1/2 80.0.0.1
Block Label-Range
1 16000 - 25000
PE2#
```

```
PE2# show mpls switching detail
VRF default
IPv4 FEC
In-Label : 16111
Out-Label stack : Pop Label
FEC : 192.168.1.11/32
Out interface : Eth1/2
Next hop : 80.0.0.1
Input traffic statistics : 0 packets, 0 bytes
Output statistics per label : label Pop Label, 0 packets, 0 bytes
Deaggregation FEC type
In-Label : 492288
VRF : default
Address-Family : IPv4
Flags : RFC3107
Input traffic statistics : 0 packets 0 bytes
Deaggregation FEC type
In-Label : 492287
VRF : KP
Address-Family : IPv4
Input traffic statistics : 132 packets 15540 bytes
ADI_SID
In-Label : 16
Out-Label stack : 3
FEC : 80.0.0.1
Out interface : Eth1/2
Next hop : 80.0.0.1
Input traffic statistics : 0 packets, 0 bytes
Output statistics per label : label 3, 0 packets, 0 bytes
*Label statistics accurate as of 117 seconds ago
Block Label-Range
1 16000 - 25000
PE2#
```

相关信息

- [有关配置EVPN与L3VPN无缝集成\(MPLS SR\)的信息](#)
- [技术支持和文档 - Cisco Systems](#)