

# 在Nexus 9000中實施VxLAN/EVPN到MPLS/SR切換

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## 簡介

本文檔介紹如何在Cisco Nexus 9000系列交換機上通過分段路由MPLS切換配置VxLAN EVPN。

## 必要條件

### 需求

思科建議您瞭解以下主題：

- MPLS 第 3 層 VPN
- MP-BGP
- 分段路由

### 採用元件

本文中的資訊係根據以下軟體和硬體版本：

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

本文中的資訊是根據特定實驗室環境內的裝置所建立。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

資料中心(DC)部署採用VXLAN EVPN的優勢包括EVPN控制平面學習、多租戶、無縫移動性、冗餘和更輕鬆的POD新增。同樣，CORE是基於標籤分發協定(LDP)的MPLS L3VPN網路，或從傳統的基於MPLS L3VPN LDP的底層過渡到更複雜的解決方案，如分段路由(SR)。

分段路由是一種根據源路由模式在網路上轉發資料包的方法。來源會選擇路徑，並將其編碼到封包標頭中，作為有序的區段清單。段是任何型別指令的識別符號。

## SR的優點

分部路由以其優勢獲採納，例如：

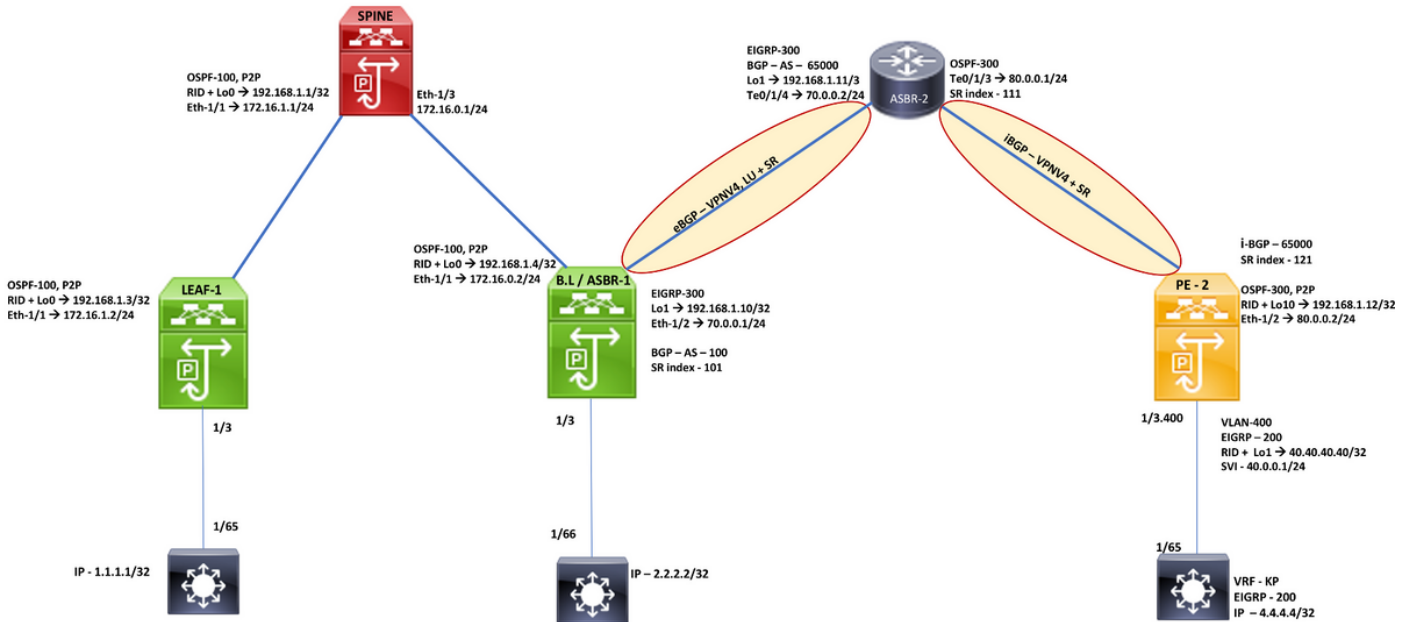
- 整合IGP MPLS控制平面。
- 為SDN做好準備：分段路由是為SDN構建的，並且是應用工程路由(AER)的基礎。SR為網路做好業務模型的準備，應用可以指導網路行為。SR在分散式智慧和集中式最佳化與程式設計之間提供了適當的平衡。
- 最低配置：TE的分段路由要求在源路由器上進行最小配置。
- 負載平衡：與RSVP-TE不同，分段路由的負載平衡可以在等價多重路徑(ECMP)存在的情況下進行。
- 支援快速重新路由(FRR):快速重新路由可在路徑出現故障的50毫秒內啟用預配置的備份路徑。
- 即插即用部署：分段路由策略可與現有MPLS控制和資料平面互操作，並且可在現有部署中實施。

## 配置EVPN與L3VPN(MPLS SR)無縫整合的准則和限制

功能	Cisco Nexus 9300-FX2交換機	採用 — R線卡的Cisco Nexus 9504和9508交換機	意見
VXLAN EVPN到SR-L3VPN	是	是	在不同的DC埠之間擴展第3層連線，使用S 展進行底層IGP/BGP。
VXLAN EVPN到SR-L3VPN	是	是	擴展運行VXLAN的DC POD與運行SR的任 ( DC或核心 ) 之間的第3層連線。
VXLAN EVPN至MPLS L3VPN(LDP)	否	是	底層是LDP。

## 設定

### 網路圖表



## 組態

### 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
```

## 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	?	?
*>20.0.0.24	192.168.1.3	0	100	0	?
*>30.0.0.20/32	192.168.1.3	0	100	0	?
*>30.0.0.0/24	0.0.0.0	0	100	32768	?
*>30.30.30.32	0.0.0.0	0	100	32768	?
*>e40.0.0.24	192.168.1.11	0	65000	?	?
*>e40.40.40.32	192.168.1.11	0	65000	?	?
Route Distinguisher: 192.168.1.12:3					
*>e4.4.4.4/32	192.168.1.11	0	65000	?	?
*>e40.0.0.24	192.168.1.11	0	65000	?	?
*>e40.40.40.32	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# 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

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: 40.40.40.32, 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 ?
*> 20.20.20.0/24 192.168.1.10 0 100 ?
*> 30.0.0.0/24 192.168.1.10 0 0 100 ?
*> 30.30.30.0/24 192.168.1.10 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 ?
*> 40.40.40.0/24 192.168.1.12 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 192.168.1.4:3:20.0.0.0/24 \
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 192.168.1.4:3:20.0.0.0/24 \
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
SRHandle: 3 ClientType: BGP ClientHandle: 7FB45ADF9A8
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
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
PREFIX_SID_PROTOCOL_ADV_MAP_ALGO_1
192.168.1.12:3:40.0.0.0/24 100 Indx 1 Y BGP 192.168.1.4
192.168.1.12:3:40.40.40.0/32 100 Indx 1 Y BGP 192.168.1.4
192.168.1.12:3:20.0.0.0/24 100 Indx 1 Y BGP 192.168.1.4
192.168.1.12:3:20.20.20.0/32 100 Indx 1 Y BGP 192.168.1.4
PREFIX_SID_PROTOCOL_ADV_MAP_ALGO_2
192.168.1.12:3:4.4.4.4/32 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:40.0.0.0/24 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:40.40.40.0/32 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:20.0.0.0/24 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:20.20.20.0/32 100 Indx 1 Y BGP 192.168.1.12
PREFIX_SID_PROTOCOL_ADV_MAP_ALGO_3
192.168.1.12:3:1.1.1.1/32 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:2.2.2.2/32 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:20.0.0.0/24 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:20.20.20.0/24 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:30.0.0.0/24 100 Indx 1 Y BGP 192.168.1.12
192.168.1.12:3:30.30.30.0/24 100 Indx 1 Y BGP 192.168.1.12
P-Router#
```

```
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-redis, 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 ?
*> 20.20.20.0/24 192.168.1.11 0 100 0 100 ?
*> 30.0.0.0/24 192.168.1.11 0 100 0 100 ?
*> 30.30.30.0/24 192.168.1.11 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 ?
*> 20.20.20.0/24 192.168.1.11 0 100 0 100 ?
*> 30.0.0.0/24 192.168.1.11 0 100 0 100 ?
*> 30.30.30.0/24 192.168.1.11 0 100 0 100 ?
*> 40.0.0.0/24 0.0.0.0 0 100 32768 ?
*> 40.40.40.0/24 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#
```

### Far-End PE Verification

```
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 |||192.168.1.12/32|Eth1/2|0 SWAP
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#
```

## 相關資訊

- [有關配置EVPN與L3VPN\(MPLS SR\)無縫整合的資訊](#)
- [技術支援與文件 - Cisco Systems](#)