

# Implemente EVPN de Capa 3 sobre MPLS de routing de segmentos en Nexus 9300

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## Introducción

Este documento describe cómo implementar/configurar la VPN Ethernet de capa 3 (L3) (EVPN) sobre el routing de segmentos (SR) Multiprotocol Label Switching (MPLS) [Open Shortest Path First (OSPF) / Internal Border Gateway Protocol (iBGP)] en productos Nexus 9300.

## Prerequisites

### Requirements

Cisco recomienda que tenga conocimiento sobre estos temas:

- Border Gateway Protocol (BGP)
- L3VPN
- EVPN
- SR

### Componentes Utilizados

La información que contiene este documento se basa en las siguientes versiones de software y hardware.

- Hardware SPINE - 93360YC-FX2 que ejecuta la versión 9.3.(3)
- Hardware LEAF - 93240YC-FX2 que ejecuta la versión 9.3.(3)
- CLIENTE - 93216TC-FX2

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Antecedentes

### MPLS L3VPN Recap

Una VPN es:

- Una red basada en IP que ofrece servicios de red privada a través de una infraestructura pública.
- Un conjunto de sitios que pueden comunicarse entre sí de forma privada a través de Internet u otras redes públicas o privadas.

Las VPN convencionales se crean configurando una malla completa de túneles o circuitos virtuales permanentes (PVC) en todos los sitios de una VPN. Este tipo de VPN no es fácil de mantener o ampliar, ya que la adición de un nuevo sitio requiere un cambio en cada dispositivo de borde en la VPN.

Las VPN basadas en MPLS se crean en L3 y se basan en el modelo de peer. El modelo de peer permite al proveedor de servicios y al cliente intercambiar información de ruteo de L3. El proveedor de servicios transmite los datos entre las instalaciones del cliente sin la participación del cliente.

Las VPN MPLS son más fáciles de administrar y ampliar que las VPN convencionales. Cuando se agrega un nuevo sitio a una VPN MPLS, sólo se debe actualizar el router de borde del proveedor de servicios que proporciona servicios al sitio del cliente.

Estos son los componentes de MPLS VPN:

- Router del proveedor (P): router en el núcleo de la red del proveedor. Los routers P ejecutan el switching MPLS y no adjuntan etiquetas VPN a los paquetes enrutados. Las etiquetas VPN se utilizan para dirigir los paquetes de datos a la red privada correcta o al router de borde del cliente.
- Router PE - Router que conecta la etiqueta VPN a los paquetes entrantes según la interfaz o subinterfaz en la que se reciben, y también conecta las etiquetas de núcleo MPLS. Un router PE se conecta directamente a un router CE.
- Router del cliente (C): router en el proveedor de servicios de Internet (ISP) o red empresarial.
- Router de borde del cliente (CE): router de borde en la red del ISP que se conecta al router PE de la red. Un router CE debe interactuar con un router PE.

### Descripción General de EVPN con L3VPN (MPLS SR)

Las implementaciones de Data Center (DC) han adoptado VXLAN EVPN o MPLS EVPN por sus ventajas, como el aprendizaje del plano de control EVPN, la multiempresa, la movilidad fluida, la redundancia y las incorporaciones POD más sencillas. De forma similar, el CORE es una red MPLS L3VPN basada en el protocolo de distribución de etiquetas (LDP) o una transición de la capa subyacente tradicional basada en LDP MPLS L3VPN a una solución más sofisticada como SR.

La SR se adopta por sus ventajas, como:

- Planos de control de MPLS e IGP unificados
- Métodos de ingeniería de tráfico más sencillos
- Configuración más sencilla
- Adopción de redes definidas por software (SDN)

EVPN (RFC 7432) es una solución basada en MPLS de BGP que se ha utilizado para los servicios Ethernet de última generación en una red de Data Center virtualizada. Utiliza varios bloques de creación, como Route Distinguisher (RD), Route Target (RT) y Virtual Routing and Forwarding (VRF), de las tecnologías MPLS que existen.

La EVPN L3 sobre SR que se introdujo en la versión NXOS 7.0(3)I6(1) utiliza la ruta EVPN Tipo 5 con encapsulación MPLS. Ofrece varios arrendatarios, escalabilidad y alto rendimiento para servicios de Data Center evolucionados.

**Nota:** En DC, el plano de datos puede ser VXLAN o MPLS.

### VPN MPLS L3 tradicional

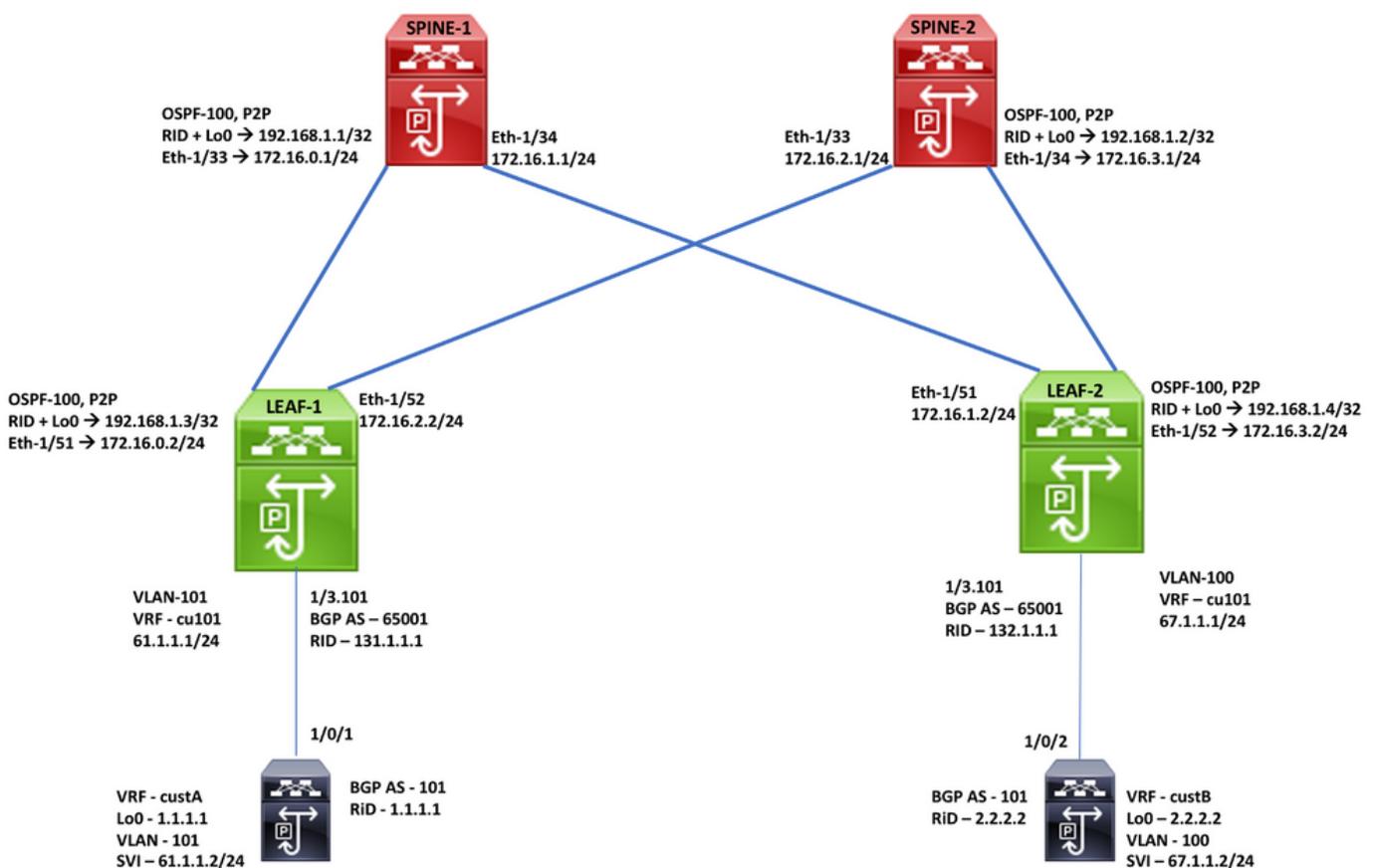
Bloques de generación principales: RD, RT y VRF  
 Capa subyacente para transporte: IGP, LDP y RSVP-TE  
 Capa de superposición para servicio: VPNv4 y VPNv6

### VPN L3 MPLS sobre SR

Bloques de generación principales: RD, RT y VRF  
 Capa subyacente para transporte: IGP/BGP-LU y TE  
 Capa de superposición para servicio: EVPN

## Configurar

### Topología



# Configuración de alto nivel

1. Funciones de instalación
2. Configurar dirección IP - Subyacente
3. Configuración de IGP - OSPF
4. Configurar MP - BGP
5. Configuración de VLAN y Superposición de EVPN
6. Configuración de e-BGP entre Hosts y LEAFs

| SPINE-1 Configuration                                  |                                 |   |
|--|---------------------------------|---|
| Enabling Features, Label-Range, Route-map, Label-Index | OSPF Configuration              | BGP/EVPN Configuration                              |
| feature-set mpls                                       | interface Ethernet1/33          | router bgp 65001                                    |
| feature ospf   | ip address 172.16.0.1/24        | router-id 192.168.1.1                               |
| feature bgp  | ip ospf network point-to-point  | address-family ipv4 unicast                         |
| feature mpls segment-routing                           | ip router ospf 100 area 0.0.0.0 | network 192.168.1.1/32 route-map label-index-spine1 |
| feature mpls evpn                                      | mpls ip forwarding              | allocate-label all                                  |
| feature interface-vlan                                 | no shutdown                     | address-family ipv4 labeled-unicast                 |
| feature mpls oam                                       |                                 | address-family l2vpn evpn                           |
|  | interface Ethernet1/34          | template peer EVPN                                  |
|  | ip address 172.16.1.1/24        | remote-as 65001                                     |
|  | ip ospf network point-to-point  | update-source loopback0                             |
| mpls label range 5000 450000                           | ip router ospf 100 area 0.0.0.0 | address-family l2vpn evpn                           |
| segment-routing  | mpls ip forwarding              | send-community extended                             |
| mpls   | no shutdown                     | route-reflector-client                              |
| global-block 16000 25000                               |                                 | encapsulation mpls                                  |
| connected-prefix-sid-map                               |                                 | template peer Labeled-unicast                       |
| address-family ipv4                                    | interface loopback0             | remote-as 65001                                     |
| 192.168.1.1/32 index 211                               | ip address 192.168.1.1/32       | address-family ipv4 labeled-unicast                 |
|  | ip router ospf 100 area 0.0.0.0 | send-community extended                             |
|  |                                 | route-reflector-client                              |
| route-map label-index-spine1 permit 10                 |                                 | next-hop-self                                       |
| set label-index 211                                    | router ospf 100                 | soft-reconfiguration inbound always                 |
|  | segment-routing mpls            | neighbor 172.16.0.2                                 |
|  | router-id 192.168.1.1           | inherit peer Labeled-unicast                        |
|  |                                 | neighbor 172.16.1.2                                 |
|  |                                 | inherit peer Labeled-unicast                        |
|  |                                 | neighbor 192.168.1.3                                |
|  |                                 | inherit peer EVPN                                   |
|  |                                 | neighbor 192.168.1.4                                |
|  |                                 | inherit peer EVPN                                   |

| SPINE-2 Configuration                                  |                                 |   |
|--|---------------------------------|---|
| Enabling Features, Label-Range, Route-map, Label-Index | OSPF Configuration              | BGP/EVPN Configuration                              |
| feature-set mpls                                       | interface Ethernet1/33          | router bgp 65001                                    |
| feature ospf   | ip address 172.16.2.1/24        | router-id 192.168.1.2                               |
| feature bgp  | ip ospf network point-to-point  | address-family ipv4 unicast                         |
| feature mpls segment-routing                           | ip router ospf 100 area 0.0.0.0 | network 192.168.1.2/32 route-map label-index-spine2 |
| feature mpls evpn                                      | mpls ip forwarding              | allocate-label all                                  |
| feature interface-vlan                                 | no shutdown                     | address-family ipv4 labeled-unicast                 |
| feature mpls oam                                       |                                 | address-family l2vpn evpn                           |
|  | interface Ethernet1/34          | template peer EVPN                                  |
|  | ip address 172.16.3.1/24        | remote-as 65001                                     |
|  | ip ospf network point-to-point  | update-source loopback0                             |
| mpls label range 5000 450000                           | ip router ospf 100 area 0.0.0.0 | address-family l2vpn evpn                           |
| segment-routing  | mpls ip forwarding              | send-community extended                             |
| mpls   | no shutdown                     | route-reflector-client                              |
| global-block 16000 25000                               |                                 | encapsulation mpls                                  |
| connected-prefix-sid-map                               | interface loopback0             | template peer Labeled-unicast                       |
| address-family ipv4                                    | ip address 192.168.1.2/32       | remote-as 65001                                     |
| 192.168.1.2/32 index 221                               | ip router ospf 100 area 0.0.0.0 | address-family ipv4 labeled-unicast                 |
|  |                                 | send-community extended                             |
|  |                                 | route-reflector-client                              |
| route-map label-index-spine2 permit 10                 |                                 | next-hop-self                                       |
| set label-index 221                                    | router ospf 100                 | soft-reconfiguration inbound always                 |
|  | segment-routing mpls            | neighbor 172.16.2.2                                 |
|  | router-id 192.168.1.2           | inherit peer Labeled-unicast                        |
|  |                                 | neighbor 172.16.3.2                                 |
|  |                                 | inherit peer Labeled-unicast                        |
|  |                                 | neighbor 192.168.1.3                                |
|  |                                 | inherit peer EVPN                                   |
|  |                                 | neighbor 192.168.1.4                                |
|  |                                 | inherit peer EVPN                                   |

| LEAF-1 Configuration                                   |                                 |   |
|--|---------------------------------|---|
| Enabling Features, Label-Range, Route-map, Label-Index | OSPF Configuration              | BGP/EVPN Configuration                              |
| feature-set mpls                                       | interface Ethernet1/3.101       | router bgp 65001                                    |
| feature ospf   | encapsulation dot1q 101         | router-id 192.168.1.3                               |
| feature bgp  | vrf member cu101                | address-family ipv4 unicast                         |
| feature mpls segment-routing                           | ip address 61.1.1.1/24          | network 192.168.1.3/32 route-map label-index-leaf-1 |
| feature mpls evpn                                      | no shutdown                     | allocate-label all                                  |
| feature interface-vlan                                 |                                 | address-family ipv4 labeled-unicast                 |
| feature mpls oam                                       | interface Ethernet1/51          | address-family l2vpn evpn                           |
|  | ip address 172.16.0.2/24        | template peer EVPN                                  |
|  | ip ospf network point-to-point  | remote-as 65001                                     |
| mpls label range 5000 450000                           | ip router ospf 100 area 0.0.0.0 | update-source loopback0                             |
|  | mpls ip forwarding              | address-family l2vpn evpn                           |
|  | no shutdown                     | send-community extended                             |
| segment-routing  |                                 | encapsulation mpls                                  |
| mpls   | interface Ethernet1/52          | template peer Labeled-unicast                       |
| global-block 16000 25000                               | ip address 172.16.2.2/24        | remote-as 65001                                     |
| connected-prefix-sid-map                               | ip ospf network point-to-point  | address-family ipv4 labeled-unicast                 |
| address-family ipv4                                    | ip router ospf 100 area 0.0.0.0 | send-community extended                             |
| 192.168.1.3/32 index 311                               | mpls ip forwarding              | soft-reconfiguration inbound always                 |
|  | no shutdown                     | template peer cu1                                   |
| route-map label-index-leaf-1 permit 10                 |                                 | address-family ipv4 unicast                         |
| set label-index 311                                    |                                 | as-override   |
|  | interface loopback0             | send-community                                      |
| vrf context cu101                                      | ip address 192.168.1.3/32       | soft-reconfiguration inbound always                 |
| rd auto  | ip router ospf 100 area 0.0.0.0 | neighbor 172.16.0.1                                 |
| address-family ipv4 unicast                            |                                 | inherit peer Labeled-unicast                        |
| route-target import 1:101                              | router ospf 100                 | neighbor 172.16.2.1                                 |
| route-target import 1:101 evpn                         | segment-routing mpls            | inherit peer Labeled-unicast                        |
| route-target export 1:101                              | router-id 192.168.1.3           | neighbor 192.168.1.1                                |
| route-target export 1:101 evpn                         |                                 | inherit peer EVPN                                   |
|  |                                 | neighbor 192.168.1.2                                |
|  |                                 | inherit peer EVPN                                   |
|  |                                 | vrf cu101   |
|  |                                 | router-id 131.1.1.1                                 |
|  |                                 | address-family ipv4 unicast                         |
|  |                                 | advertise l2vpn evpn                                |
|  |                                 | neighbor 61.1.1.2                                   |
|  |                                 | inherit peer cu1                                    |
|  |                                 | remote-as 101                                       |

## LEAF-2 Configuration

| Enabling Features, Label-Range, Route-map, Label-Index  | OSPF Configuration   | BGP/EVPN Configuration   |
|---|--|--|
| feature-set mpls<br>feature ospf<br>feature bgp<br>feature mpls segment-routing<br>feature mpls evpn<br>feature interface-vlan<br>feature mpls oam  | interface Ethernet1/3.101<br>encapsulation dot1q 100<br>vrf member cu101<br>ip address 67.1.1.1/24<br>no shutdown  | router bgp 65001<br>router-id 192.168.1.4<br>address-family ipv4 unicast<br>network 192.168.1.4/32 route-map label-index-Leaf2<br>allocate-label all<br>address-family ipv4 labeled-unicast<br>address-family l2vpn evpn<br>template peer EVPN<br>remote-as 65001<br>update-source loopback0<br>address-family l2vpn evpn<br>send-community extended<br>encapsulation mpls |
| mpls label range 5000 450000  | interface Ethernet1/51<br>ip address 172.16.1.2/24<br>ip ospf network point-to-point<br>ip router ospf 100 area 0.0.0.0<br>mpls ip forwarding<br>no shutdown | template peer Labeled-unicast<br>remote-as 65001<br>address-family ipv4 labeled-unicast<br>send-community extended<br>soft-reconfiguration inbound always<br>template peer cu1<br>address-family ipv4 unicast<br>as-override<br>send-community<br>soft-reconfiguration inbound always  |
| segment-routing<br>mpls<br>global-block 16000 25000<br>connected-prefix-sid-map<br>address-family ipv4<br>192.168.1.4/32 index 321  | interface Ethernet1/52<br>ip address 172.16.3.2/24<br>ip ospf network point-to-point<br>ip router ospf 100 area 0.0.0.0<br>mpls ip forwarding<br>no shutdown | neighbor 172.16.1.1<br>inherit peer Labeled-unicast<br>neighbor 172.16.3.1<br>inherit peer Labeled-unicast<br>neighbor 192.168.1.1<br>inherit peer EVPN<br>neighbor 192.168.1.2<br>inherit peer EVPN   |
| route-map label-index-Leaf2 permit 10<br>set label-index 321  | interface loopback0<br>ip address 192.168.1.4/32<br>ip router ospf 100 area 0.0.0.0  | vrf cu101<br>router-id 132.1.1.1<br>address-family ipv4 unicast<br>advertise l2vpn evpn<br>neighbor 67.1.1.2<br>inherit peer cu1<br>remote-as 101  |
| vrf context cu101<br>rd auto<br>address-family ipv4 unicast<br>route-target import 1:101<br>route-target import 1:101 evpn<br>route-target export 1:101<br>route-target export 1:101 evpn | router ospf 100<br>segment-routing mpls<br>router-id 192.168.1.4   |  |

## End-Host Configuration

| VRF, Loopback Configuration  | Interface, SVI Configuration  | BGP Configuration   |
|--|---|---|
| vrf definition custA<br>rd 101:1<br>!<br>address-family ipv4<br>exit-address-family<br>! | interface GigabitEthernet1/0/1<br>switchport trunk allowed vlan 101<br>switchport trunk encapsulation dot1q<br>switchport mode trunk<br>! | router bgp 101<br>bgp log-neighbor-changes<br>no bgp default ipv4-unicast<br>!<br>address-family ipv4 vrf custA<br>bgp router-id 1.1.1.1<br>network 1.1.1.1 mask 255.255.255.255<br>redistribute connected<br>neighbor 61.1.1.1 remote-as 65001<br>neighbor 61.1.1.1 activate<br>neighbor 61.1.1.1 send-community<br>neighbor 61.1.1.1 soft-reconfiguration inbound<br>exit-address-family<br>! |
| vrf definition custB<br>rd 101:2<br>!<br>address-family ipv4<br>exit-address-family      | interface GigabitEthernet1/0/2<br>switchport trunk allowed vlan 100<br>switchport trunk encapsulation dot1q<br>switchport mode trunk      | address-family ipv4 vrf custB<br>bgp router-id 2.2.2.2<br>network 2.2.2.2 mask 255.255.255.255<br>redistribute connected<br>neighbor 67.0.0.1 soft-reconfiguration inbound<br>neighbor 67.1.1.1 remote-as 65001<br>neighbor 67.1.1.1 activate<br>neighbor 67.1.1.1 send-community<br>neighbor 67.1.1.1 soft-reconfiguration inbound<br>exit-address-family                                      |
| interface Loopback0<br>vrf forwarding custA<br>ip address 1.1.1.1 255.255.255.255<br>!   | interface Vlan100<br>vrf forwarding custB<br>ip address 67.1.1.2 255.255.255.0<br>!   |   |
| interface Loopback1<br>vrf forwarding custB<br>ip address 2.2.2.2 255.255.255.255        | interface Vlan101<br>vrf forwarding custA<br>ip address 61.1.1.2 255.255.255.0<br>!   |   |

## Verificación

Utilice esta sección para confirmar que su configuración funcione correctamente.

**Leaf 1 Captures : Control Plane and MPLS Data Plane:**

**Leaf1(config)# show ip bgp 1.1.1.1 vrf cu101**

```
BGP routing table information for VRF cu101, address family IPv4 Unicast
BGP routing table entry for 1.1.1.1/32, version 4
Paths: (2 available, best #1)
Flags: (0x880c0014) (high32 0x000020) on xmit-list, is in urib, is best urib route, is in HW, exported, has label
vpn: version 3, (0x00000000100002) on xmit-list
local label: 492288

Advertised path-id 1, VRF AF advertised path-id 1
Path type: external, path is valid, is best path, no labeled nexthop, in rib
AS-Path: 101 , path sourced external to AS
61.1.1.2 (metric 0) from 61.1.1.2 (1.1.1.1)
Origin IGP, MED 0, localpref 100, weight 0
Extcommunity: RT:1:101

Path type: external, path is valid, received only, no labeled nexthop
AS-Path: 101 , path sourced external to AS
61.1.1.2 (metric 0) from 61.1.1.2 (1.1.1.1)
Origin IGP, MED 0, localpref 100, weight 0

VRF advertise information:
Path-id 1 not advertised to any peer

VRF AF advertise information:
Path-id 1 not advertised to any peer
```

**Leaf1(config)# show bgp l2vpn evpn 1.1.1.1**

```
BGP routing table information for VRF default, address family L2VPN EVPN
Route Distinguisher: 192.168.1.3:3
BGP routing table entry for [5]:[0]:[0]:[32]:[1.1.1.1]/224, version 6
Paths: (1 available, best #1)
Flags: (0x000002) (high32 00000000) on xmit-list, is not in l2rib/evpn, has label
local label: 492288

Advertised path-id 1
Path type: local, path is valid, is best path, no labeled nexthop
Gateway IP: 0.0.0.0
AS-Path: 101 , path sourced external to AS
0.0.0.0 (metric 0) from 0.0.0.0 (192.168.1.3)
Origin IGP, MED 0, localpref 100, weight 0
Received label 0
Extcommunity: RT:1:101

Path-id 1 advertised to peers:
192.168.1.1 192.168.1.2
```

**Leaf1(config)# show bgp ipv4 labeled-unicast 192.168.1.3**

```
BGP routing table information for VRF default, address family IPv4 Label Unicast
BGP routing table entry for 192.168.1.3/32, version 8
Paths: (1 available, best #1)
Flags: (0x20c0002) (high32 00000000) on xmit-list, is not in urib, has label
label af: version 11, (0x0000000100002) on xmit-list
local label: 3

Advertised path-id 1, Label AF advertised path-id 1
Path type: local, path is valid, is best path, no labeled nexthop
AS-Path: NONE, path locally originated
0.0.0.0 (metric 0) from 0.0.0.0 (192.168.1.3)
Origin IGP, MED not set, localpref 100, weight 32768
Prefix-SID Attribute: Length: 10
Label Index TLV: Length 7, Flags 0x0 Label Index 311

Path-id 1 not advertised to any peer

Label AF advertisement
Path-id 1 advertised to peers:
172.16.0.1 172.16.2.1
```

**Leaf1(config)# show forwarding mpls 192.168.1.4/32**

```
slot 1
-----
Local |Prefix |FEC |Next-Hop |Interface |Out
Label |Table Id |(Prefix/Tunnel id) | | |Label
-----|-----|-----|-----|-----|-----
16321 |0x1 |192.168.1.4/32 |172.16.0.1 |Eth1/51 |16321 SWAP
" |0x1 |192.168.1.4/32 |172.16.2.1 |Eth1/52 |16321 SWAP
```

**Leaf 2 Captures : Control Plane and MPLS Data Plane:**

**Leaf2# show forwarding 1.1.1.1/32 vrf cu101**

```
slot 1
-----
IPv4 routes for table cu101/base
-----
Prefix | Next-hop | Interface | Labels | Partial Install
-----|-----|-----|-----|-----
1.1.1.1/32 | 172.16.1.1 | Ethernet1/51 | POHS 14311 492288
" | 172.16.3.1 | Ethernet1/52 | POHS 14311 492288

Leaf2#
Leaf2#
```

**Leaf2# show forwarding 172.16.1.1/24**

```
slot 1
-----
IPv4 routes for table default/base
-----
Prefix | Next-hop | Interface | Labels | Partial Install
-----|-----|-----|-----|-----
172.16.1.0/24 | Attached | Ethernet1/51 | |
Leaf2#
Leaf2#
```

**Leaf2# show forwarding mpls 192.168.1.3/32**

```
slot 1
-----
Local |Prefix |FEC |Next-Hop |Interface |Out
Label |Table Id |(Prefix/Tunnel id) | | |Label
-----|-----|-----|-----|-----|-----
16311 |0x1 |192.168.1.3/32 |172.16.1.1 |Eth1/51 |16311 SWAP
" |0x1 |192.168.1.3/32 |172.16.3.1 |Eth1/52 |16311 SWAP
```

**Leaf2# show forwarding 192.168.1.3/32**

```
slot 1
-----
IPv4 routes for table default/base
-----
Prefix | Next-hop | Interface | Labels | Partial Install
-----|-----|-----|-----|-----
192.168.1.3/32 | 172.16.1.1 | Ethernet1/51 | POHS 14311
" | 172.16.3.1 | Ethernet1/52 | POHS 14311
```

**Spine 1 Captures**

**spine1# show bgp ipv4 labeled-unicast 1.1.1.1**

```
spine1# show bgp l2vpn evpn 1.1.1.1
BGP routing table information for VRF default, address family L2VPN EVPN
Route Distinguisher: 192.168.1.3:3
BGP routing table entry for [5]:[0]:[0]:[32]:[1.1.1.1]/224, version 5
Paths: (1 available, best #1)
Flags: (0x000002) (high32 00000000) on xmit-list, is not in l2rib/evpn, is not in HW

Advertised path-id 1
Path type: internal, path is valid, is best path
Gateway IP: 0.0.0.0
AS-Path: 101 , path sourced external to AS
192.168.1.3 (metric 0) from 192.168.1.3 (192.168.1.3)
Origin IGP, MED 0, localpref 100, weight 0
Received label 492288
Extcommunity: RT:1:101

Path-id 1 advertised to peers:
192.168.1.4
```

**spine1# show bgp ipv4 labeled-unicast 192.168.1.3**

```
BGP routing table information for VRF default, address family IPv4 Label Unicast
BGP routing table entry for 192.168.1.3/32, version 5
Paths: (1 available, best #1)
Flags: (0x820c0012) (high32 00000000) on xmit-list, is in urib, is backup urib route, is in HW, has label
label af: version 7, (0x00000000100002) on xmit-list
local label: 16311

Advertised path-id 1, Label AF advertised path-id 1
Path type: internal, path is valid, received and used, is best path, no labeled nexthop, in rib
AS-Path: NONE, path sourced internal to AS
172.16.0.2 (metric 0) from 172.16.0.2 (192.168.1.3)
Origin IGP, MED not set, localpref 100, weight 0
Received label 3
Prefix-SID Attribute: Length: 10
Label Index TLV: Length 7, Flags 0x0 Label Index 311

Path-id 1 not advertised to any peer

Label AF advertisement
Path-id 1 advertised to peers:
172.16.1.2
```

**spine1# show forwarding mpls 192.168.1.4/32**

```
slot 1
-----
Local |Prefix |FEC |Next-Hop |Interface |Out
Label |Table Id |(Prefix/Tunnel id) | | |Label
-----|-----|-----|-----|-----|-----
16321 |0x1 |192.168.1.4/32 |172.16.1.2 |Eth1/34 |0 SWAP
```

## End-Host Captures

```
endhost#show ip int brief
```

| Interface | IP-Address | OK? | Method | Status | Protocol |
|-----------|------------|-----|--------|--------|----------|
| Vlan1     | unassigned | YES | NVRAM  | up     | up       |
| Vlan100   | 67.1.1.2   | YES | manual | up     | up       |
| Vlan101   | 61.1.1.2   | YES | manual | up     | up       |
| Loopback0 | 1.1.1.1    | YES | manual | up     | up       |
| Loopback1 | 2.2.2.2    | YES | manual | up     | up       |

```
endhost#ping vrf custB 1.1.1.1
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/7/17 ms
```

```
endhost#ping vrf custA 2.2.2.2
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/8/17 ms
```

```
endhost#traceroute vrf custB 1.1.1.1
```

```
Type escape sequence to abort.  
Tracing the route to 1.1.1.1  
VRF info: (vrf in name/id, vrf out name/id)  
 1 67.1.1.1 0 msec 8 msec 0 msec  
 2 172.16.3.1 0 msec 0 msec 0 msec  
 3 172.16.0.2 0 msec  
   172.16.2.2 0 msec  
   172.16.0.2 8 msec  
 4 61.1.1.2 0 msec * 0 msec
```

```
endhost#traceroute vrf custA 2.2.2.2
```

```
Type escape sequence to abort.  
Tracing the route to 2.2.2.2  
VRF info: (vrf in name/id, vrf out name/id)  
 1 61.1.1.1 0 msec 17 msec 0 msec  
 2 172.16.2.1 17 msec  
   172.16.0.1 0 msec  
   172.16.2.1 9 msec  
 3 172.16.3.2 0 msec  
   172.16.1.2 0 msec  
   172.16.3.2 17 msec  
 4 67.1.1.2 8 msec * 0 msec  
endhost#
```

## Troubleshoot

Actualmente, no hay información específica de troubleshooting disponible para esta configuración.

## Información Relacionada

- [VPN MPLS BGP Multiprotocolo](#)
- [Informe técnico de routing de segmentos en switches de plataforma Cisco Nexus 9500, 9300, 9200, 3200 y 3100](#)
- [Configuración de EVPN de Capa 3 y VPN de Capa 3 sobre MPLS de Ruteo de Segmentos](#)
- [Soporte Técnico y Documentación - Cisco Systems](#)