

Implementación de Nexus L2 EVPN sobre MPLS de routing de segmentos

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Introducción

Este documento describe cómo implementar/configurar EVPN de Capa 2 sobre MPLS de ruteo de segmentos en switches Nexus de Cisco serie 9000.

Prerequisites

Requirements

Se requiere para tener conocimiento sobre BGP, OSPF, MPLS, LDP, RSVP, EVPN, Segment Routing(SR)

Componentes Utilizados

Switch Cisco Nexus 93360YC-FX2 en ejecución con 9.3.(3)

Switch Cisco Nexus 93240YC-FX2 con 9.3.(3)

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.

Background

Definición de VPN de Capa 2, VPLS/L2-EVPN es un servicio de VPN de Capa 2 Multipunto a Multipunto que conecta múltiples ramas de un Cliente, en una única arquitectura lógica conmutada a través de una red IP/MPLS.

EVPN-MPLS SR de Capa 2:

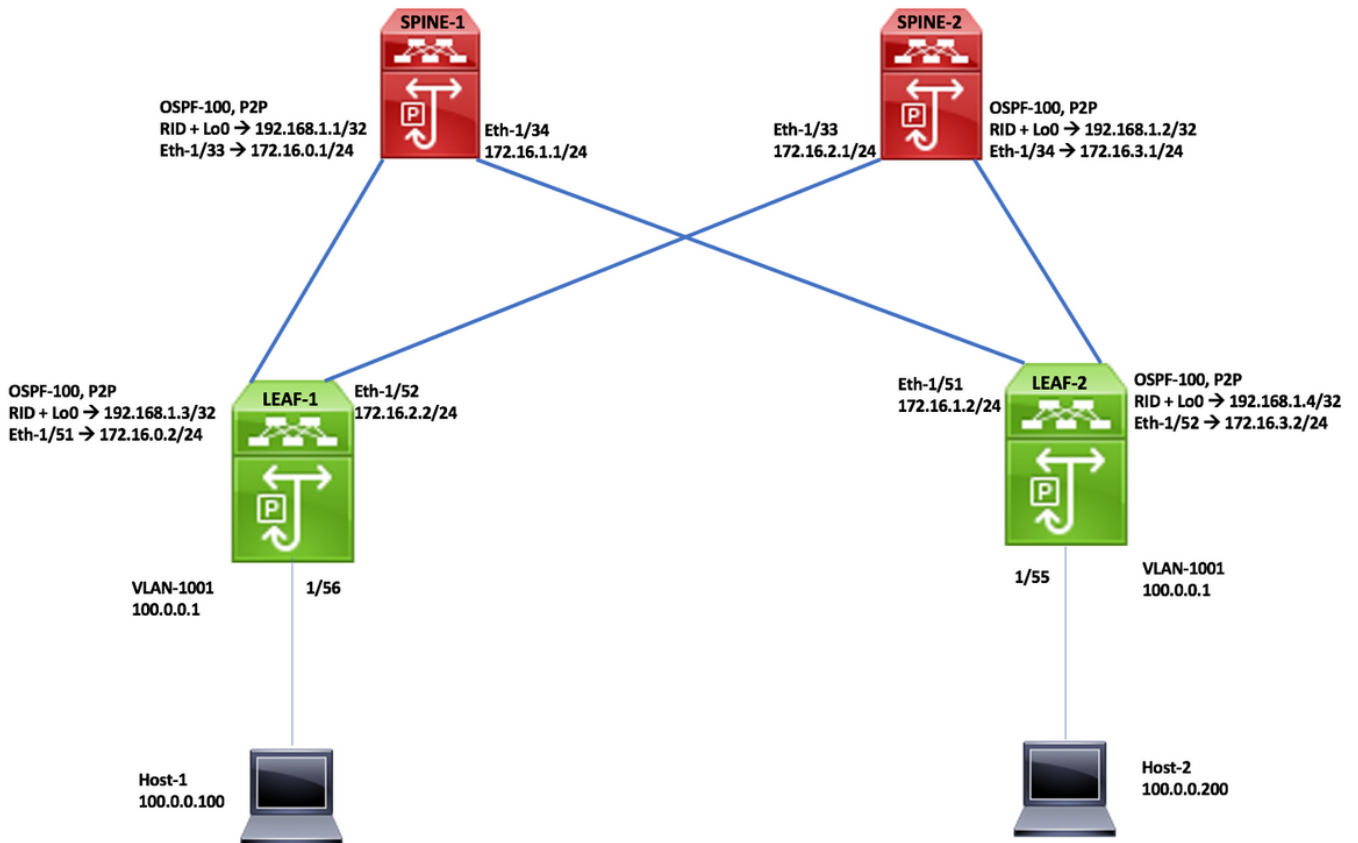
- EVPN (RFC 7432) es una solución basada en MPLS de BGP que se ha utilizado para los servicios Ethernet de última generación en la red de Data Center virtualizada
- EVPN utiliza varios bloques de creación como 'RD', 'RT' y 'VRF' de las tecnologías MPLS existentes
- EVPN actúa a diferencia de las VPLS existentes al habilitar el aprendizaje de MAC basado en el plano de control en el núcleo
- En EVPN, los PE que participan en las instancias de EVPN aprenden las rutas MAC del cliente en el plano de control mediante el protocolo MP-BGP
- El aprendizaje de MAC en el plano de control proporciona una serie de ventajas que permiten a EVPN hacer frente a las deficiencias de VPLS, incluida la compatibilidad con el multihoming con equilibrio de carga por flujo
- SR L2 EVPN es una nueva función disponible en NXOS 9.3(1) y es compatible con la plataforma Nexus serie 9300 FX2

Limitaciones para L2 EVPN sobre SR MPLS:

- La inundación EVPN de Capa 2 de ruteo de segmentos se basa en el mecanismo de replicación de ingreso
- Utiliza la ruta EVPN Tipo 3 para el tráfico BUM
- El núcleo MPLS no admite multidifusión
- No se admite la supresión ARP
- No se admite la comprobación de coherencia en VPC
- El mismo EVI L2 y EVI L3 no se pueden configurar juntos

Configurar

Diagrama de la red



Pasos de configuración de alto nivel:

- Funciones de instalación
- Configurar Dirección Ip -Subyacente
- Configuración de IGP-OSPF
- Configuración de MP-BGP
- Configuración de VLAN y Superposición de EVPN
- Configuración del host final para la capa 2

SPINE -1 Configuration

Enabling Features, Label-Range, Route-map, Label-Index	OSPF Configuration	BGP/EVPN Configuration
install feature-set mpls feature-set mpls feature ospf feature bgp feature mpls segment-routing feature mpls evpn feature interface-vlan feature mpls oam mpls label range 5000 450000 segment-routing mpls global-block 16000 25000 connected-prefix-sid-map address-family ipv4 192.168.1.1/32 index 211 route-map label-index-spine1 permit 10 set label-index 211	interface Ethernet1/33 ip address 172.16.0.1/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface Ethernet1/34 ip address 172.16.1.1/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface loopback0 ip address 192.168.1.1/32 ip router ospf 100 area 0.0.0.0 router ospf 100 segment-routing mpls router-id 192.168.1.1	router bgp 65001 router-id 192.168.1.1 address-family ipv4 unicast network 192.168.1.1/32 route-map label-index-spine1 allocate-label all address-family ipv4 labeled-unicast address-family l2vpn evpn template peer EVPN remote-as 65001 update-source loopback0 address-family l2vpn evpn send-community extended route-reflector-client encapsulation mpls template peer Labeled-unicast remote-as 65001 address-family ipv4 labeled-unicast send-community extended route-reflector-client next-hop-self soft-reconfiguration inbound always neighbor 172.16.0.2 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
install feature-set mpls feature-set mpls feature ospf feature bgp feature mpls segment-routing feature mpls evpn feature interface-vlan feature mpls oam mpls label range 5000 450000 segment-routing mpls global-block 16000 25000 connected-prefix-sid-map address-family ipv4 192.168.1.2/32 index 221 route-map label-index-spine2 permit 10 set label-index 221	interface Ethernet1/33 ip address 172.16.2.1/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface Ethernet1/34 ip address 172.16.3.1/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface loopback0 ip address 192.168.1.2/32 ip router ospf 100 area 0.0.0.0 router ospf 100 segment-routing mpls router-id 192.168.1.2	router bgp 65001 router-id 192.168.1.2 address-family ipv4 unicast network 192.168.1.2/32 route-map label-index-spine2 allocate-label all address-family ipv4 labeled-unicast address-family l2vpn evpn template peer EVPN remote-as 65001 update-source loopback0 address-family l2vpn evpn send-community extended route-reflector-client encapsulation mpls template peer Labeled-unicast remote-as 65001 address-family ipv4 labeled-unicast send-community extended route-reflector-client next-hop-self soft-reconfiguration inbound always neighbor 172.16.2.2 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
install feature-set mpls nv overlay evpn feature ospf feature bgp feature mpls segment-routing feature mpls evpn feature interface-vlan feature mpls oam feature nv overlay fabric forwarding anycast-gateway-mac 0000.0000.1111 mpls label range 5000 450000 vlan 1,1001 segment-routing mpls global-block 16000 25000 connected-prefix-sid-map address-family ipv4 192.168.1.3/32 index 311 vlan 1001 evi auto route-map label-index-leaf-1 permit 10 set label-index 311 vrf context Tenant-A evi 30001 interface Vlan1001 no shutdown vrf member Tenant-A ip address 100.0.0.1/24 fabric forwarding mode anycast-gateway	interface Ethernet1/51 ip address 172.16.0.2/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface Ethernet1/52 ip address 172.16.2.2/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface Ethernet1/56 switchport switchport mode trunk switchport trunk allowed vlan 1001 no shutdown interface loopback0 ip address 192.168.1.3/32 ip router ospf 100 area 0.0.0.0 router ospf 100 segment-routing mpls router-id 192.168.1.3	router bgp 65001 router-id 192.168.1.3 address-family ipv4 unicast network 192.168.1.3/32 route-map label-index-leaf-1 allocate-label all address-family ipv4 labeled-unicast address-family l2vpn evpn template peer EVPN remote-as 65001 update-source loopback0 address-family l2vpn evpn send-community extended encapsulation mpls template peer Labeled-unicast remote-as 65001 address-family ipv4 labeled-unicast send-community extended soft-reconfiguration inbound always neighbor 172.16.0.1 inherit peer Labeled-unicast neighbor 172.16.2.1 inherit peer Labeled-unicast neighbor 192.168.1.1 inherit peer EVPN neighbor 192.168.1.2 inherit peer EVPN vrf Tenant-A evpn encapsulation mpls source-interface loopback0

Leaf-2 Configuration

Enabling Features, Label-Range, Route-map, Label-Index	OSPF Configuration	BGP/EVPN Configuration
install feature-set mpls nv overlay evpn feature ospf feature bgp feature mpls segment-routing feature mpls evpn feature interface-vlan feature mpls oam feature nv overlay fabric forwarding anycast-gateway-mac 0000.0000.1111 mpls label range 5000 450000 vlan 1,1001 segment-routing mpls global-block 16000 25000 connected-prefix-sid-map address-family ipv4 192.168.1.4/32 index 321 vlan 1001 evi auto route-map label-index-Leaf2 permit 10 set label-index 321 vrf context Tenant-A evi 30001 interface Vlan1001 no shutdown vrf member Tenant-A ip address 100.0.0.1/24 fabric forwarding mode anycast-gateway	interface Ethernet1/51 ip address 172.16.1.2/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface Ethernet1/52 ip address 172.16.3.2/24 ip ospf network point-to-point ip router ospf 100 area 0.0.0.0 mpls ip forwarding no shutdown interface Ethernet1/55 switchport switchport mode trunk switchport trunk allowed vlan 1001 no shutdown interface loopback0 ip address 192.168.1.4/32 ip router ospf 100 area 0.0.0.0 router ospf 100 segment-routing mpls router-id 192.168.1.4	router bgp 65001 router-id 192.168.1.4 address-family ipv4 unicast network 192.168.1.4/32 route-map label-index-Leaf2 allocate-label all address-family ipv4 labeled-unicast address-family l2vpn evpn template peer EVPN remote-as 65001 update-source loopback0 address-family l2vpn evpn send-community extended encapsulation mpls template peer Labeled-unicast remote-as 65001 address-family ipv4 labeled-unicast send-community extended soft-reconfiguration inbound always neighbor 172.16.1.1 inherit peer Labeled-unicast neighbor 172.16.3.1 inherit peer Labeled-unicast neighbor 192.168.1.1 inherit peer EVPN neighbor 192.168.1.2 inherit peer EVPN vrf Tenant-A evpn encapsulation mpls source-interface loopback0

Verificación

Host1# show ip int brief

```
IP Interface Status for VRF "default"(1)
Interface IP Address Interface Status
Vlan1001 100.0.0.200 protocol-up/link-up/admin-up
```

Mhost1# ping 100.0.0.100

```
PING 100.0.0.100 (100.0.0.100): 56 data bytes
64 bytes from 100.0.0.100: icmp_seq=0 ttl=253 time=0.84 ms
64 bytes from 100.0.0.100: icmp_seq=1 ttl=253 time=0.45 ms
64 bytes from 100.0.0.100: icmp_seq=2 ttl=253 time=0.443 ms
64 bytes from 100.0.0.100: icmp_seq=3 ttl=253 time=0.438 ms
64 bytes from 100.0.0.100: icmp_seq=4 ttl=253 time=0.431 ms
```

--- 100.0.0.100 ping statistics ---

```
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.431/0.52/0.84 ms
```

Host2# show ip int brief

```
IP Interface Status for VRF "default"(1)
Interface IP Address Interface Status
Vlan1001 100.0.0.100 protocol-up/link-up/admin-up
```

Mhost2# ping 100.0.0.200

```
PING 100.0.0.200 (100.0.0.200): 56 data bytes
64 bytes from 100.0.0.200: icmp_seq=0 ttl=253 time=0.854 ms
64 bytes from 100.0.0.200: icmp_seq=1 ttl=253 time=0.46 ms
64 bytes from 100.0.0.200: icmp_seq=2 ttl=253 time=0.451 ms
64 bytes from 100.0.0.200: icmp_seq=3 ttl=253 time=0.427 ms
64 bytes from 100.0.0.200: icmp_seq=4 ttl=253 time=0.418 ms
```

--- 100.0.0.200 ping statistics ---

```
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.418/0.522/0.854 ms
```

Mhost2#

Leaf1# show bgp l2vpn evpn

BGP routing table information for VRF default, address family L2VPN EVPN

BGP table version is 57, 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-injecte

Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 192.168.1.3:37864 (L2VNI 1001)					
*>[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[0]:[0.0.0.0]/216	192.168.1.4	100	0	i	
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[0]:[0.0.0.0]/216	192.168.1.3	100	32768	i	
*>[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[32]:[100.0.0.100]/248					
192.168.1.4	100	0	i		
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[32]:[100.0.0.200]/272					
192.168.1.3	100	32768	i		
*>[3]:[0]:[32]:[192.168.1.3]/88	192.168.1.3	100	32768	i	
*>[3]:[0]:[32]:[192.168.1.4]/88	192.168.1.4	100	0	i	

Route Distinguisher: 192.168.1.4:37864

```
*|[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[0]:[0.0.0.0]/216
192.168.1.4 100 0 i
*i| 192.168.1.4 100 0 i
*>[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[32]:[100.0.0.100]/248
192.168.1.4 100 0 i
*i| 192.168.1.4 100 0 i
*>[3]:[0]:[32]:[192.168.1.4]/88
192.168.1.4 100 0 i
*i| 192.168.1.4 100 0 i
```

Leaf2# show bgp l2vpn evpn

BGP routing table information for VRF default, address family L2VPN EVPN

BGP table version is 40, 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-injecte

Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 192.168.1.3:37864					
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[0]:[0.0.0.0]/216	192.168.1.3	100	0	i	
* 192.168.1.3	100	0	i		
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[32]:[100.0.0.200]/272	192.168.1.3	100	0	i	
* 192.168.1.3	100	0	i		
*>[3]:[0]:[32]:[192.168.1.3]/88	192.168.1.3	100	0	i	
* 192.168.1.3	100	0	i		
Route Distinguisher: 192.168.1.4:37864 (L2VNI 1001)					
*>[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[0]:[0.0.0.0]/216	192.168.1.4	100	32768	i	
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[0]:[0.0.0.0]/216	192.168.1.3	100	0	i	
*>[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[32]:[100.0.0.100]/248	192.168.1.4	100	32768	i	
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[32]:[100.0.0.200]/272	192.168.1.3	100	0	i	
*>[3]:[0]:[32]:[192.168.1.3]/88	192.168.1.3	100	0	i	
*>[3]:[0]:[32]:[192.168.1.4]/88	192.168.1.4	100	32768	i	

Referencias

[Informe técnico de routing de segmentos en switches de plataforma Cisco Nexus 9500, 9300, 9200, 3200 y 3100](#)

[Configuración de EVPN de Capa 2 sobre MPLS de Ruteo de Segmentos](#)