

# Implementação do Nexus L2 EVPN sobre MPLS de roteamento de segmento

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## Introduction

Este documento descreve como implantar/configurar o Layer2 EVPN sobre Segment Routing MPLS nos switches Cisco Nexus 9000 Series.

## Prerequisites

### Requirements

É necessário ter conhecimento sobre BGP, OSPF, MPLS, LDP, RSVP, EVPN, Roteamento de Segmento (SR)

### Componentes Utilizados

Switch Cisco Nexus 93360YC-FX2 em execução com 9.3.(3)

Switch Cisco Nexus 93240YC-FX2 em execução com 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

Defina a VPN de Camada 2, VPLS/L2-EVPN é um serviço VPN de Camada 2 Multiponto a Multiponto que conecta várias filiais de um cliente, em uma única arquitetura comutada lógica sobre uma rede IP/MPLS.

### Camada 2 EVPN-MPLS SR:

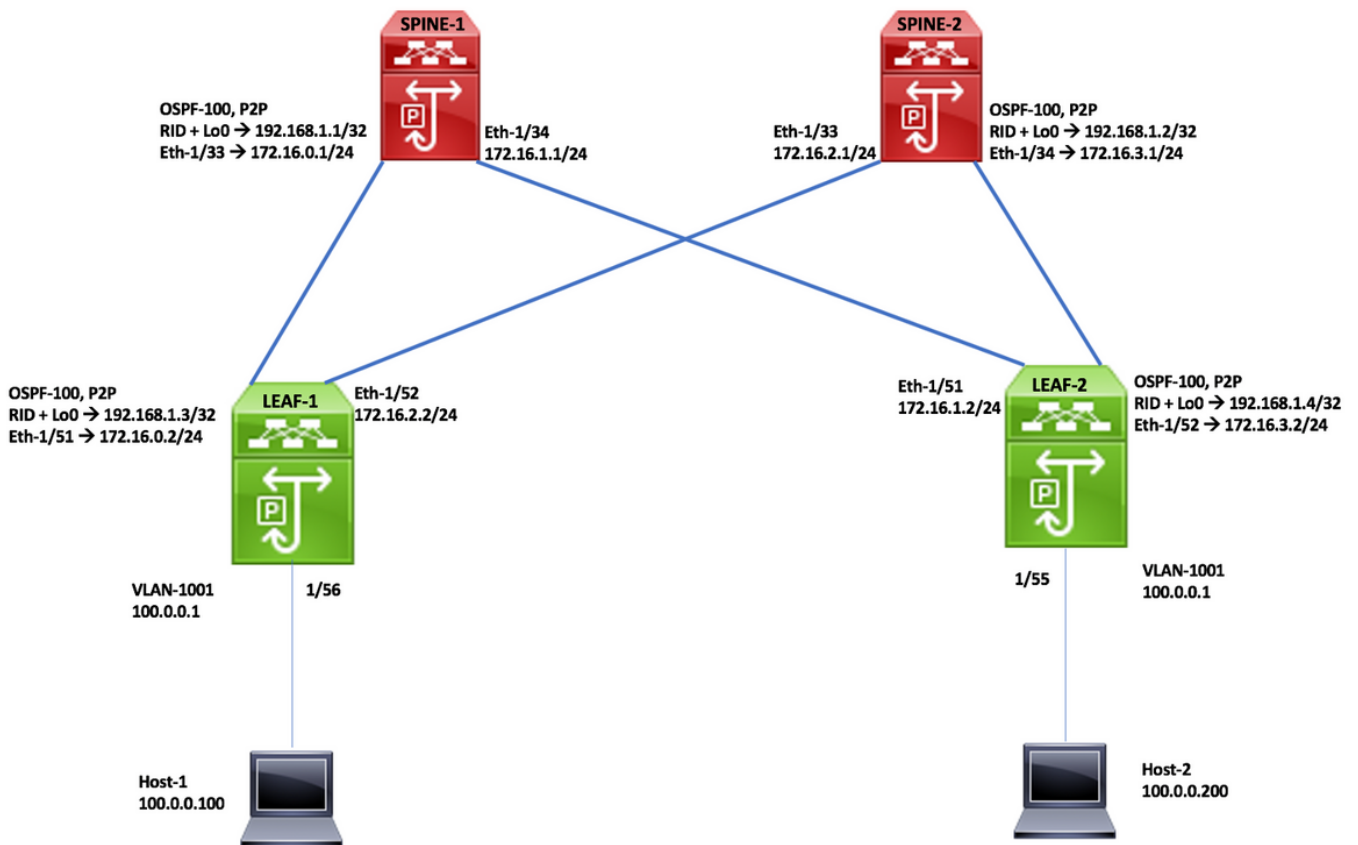
- O EVPN (RFC 7432) é uma solução baseada em BGP MPLS que foi usada para serviços Ethernet de próxima geração em redes de data center virtualizadas
- O EVPN usa vários blocos componentes como "RD", "RT" e "VRF" das tecnologias MPLS existentes
- O EVPN opera em contraste com o VPLS existente, permitindo o aprendizado MAC baseado no plano de controle no núcleo
- No EVPN, os PEs que participam das instâncias do EVPN aprendem as rotas MAC do cliente no plano de controle usando o protocolo MP-BGP
- O aprendizado MAC do plano de controle fornece vários benefícios que permitem que o EVPN resolva as falhas do VPLS, incluindo suporte para multihoming com balanceamento de carga por fluxo
- SR L2 EVPN é um novo recurso disponível no NXOS 9.3(1) e é suportado na plataforma da série Nexus 9300 FX2

#### **Limitações para L2 EVPN sobre SR MPLS:**

- A inundação de EVPN de Camada 2 de roteamento de segmento é baseada no mecanismo de replicação de entrada
- Ele usa a rota EVPN tipo 3 para tráfego BUM
- O núcleo MPLS não suporta multicast
- A supressão ARP não é suportada
- A verificação de consistência em VPC não é suportada
- O mesmo L2 EVI e L3 EVI não podem ser configurados juntos

## **Configurar**

### **Diagrama de Rede**



### Etapas da configuração de alto nível:

- Instalar recursos
- Configurar Endereço Ip - Subcamada
- Configurar IGP -OSPF
- Configurar MP-BGP
- Configurar VLAN e sobreposição EVPN
- Configurar o host final para a camada 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

# Verificação

## 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
<b>Route Distinguisher: 192.168.1.3:37864 (L2VNI 1001)</b>					
*>[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	
<b>*&gt;[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[32]:[100.0.0.100]/248</b>					
192.168.1.4	100	0	i		
<b>*&gt;[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[32]:[100.0.0.200]/272</b>					
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
<b>Route Distinguisher: 192.168.1.3:37864</b>					
*>[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[0]:[0.0.0.0]/216	192.168.1.3	100	0	i	
* 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	
* i 192.168.1.3	100	0	i		
*>[3]:[0]:[32]:[192.168.1.3]/88	192.168.1.3	100	0	i	
* i 192.168.1.3	100	0	i		
<b>Route Distinguisher: 192.168.1.4:37864 (L2VNI 1001)</b>					
*>[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	
<b>*&gt;[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[32]:[100.0.0.100]/248</b>					
192.168.1.4	100	32768	i		
<b>*&gt;[2]:[0]:[0]:[48]:[00ee.ab39.fb4b]:[32]:[100.0.0.200]/272</b>					
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	

# Referências

[Segmento de roteamento nos switches de plataforma Cisco Nexus 9500, 9300, 9200, 3200 e 3100 White paper](#)

[Configurando o EVPN de Camada 2 sobre o MPLS de Roteamento de Segmento](#)