Configurar EVPN de camada 3 sobre SR MPLS [eBGP] no Nexus 9300

Contents

[Introduction](#)
[Prerequisites](#)
[Requirements](#)
[Componentes Utilizados](#)
[Informações de Apoio](#)
[Recapitulação MPLS L3VPN](#)
[Visão geral do EVPN com L3VPN (MPLS SR)](#)
[Diagrama de Rede](#)
[Configuração de alto nível](#)
[Verificar](#)
[Troubleshoot](#)

Introduction

Este documento descreve como implantar a Ethernet VPN (EVPN) em Multiprotocol Label Switching de Roteamento de Segmento (SR) no Nexus 9300 com BGP externo.

Prerequisites

Requirements

A Cisco recomenda que você tenha conhecimento destes tópicos:

- Protocolo BGP
- L3VPN
- EVPN
- SR

Componentes Utilizados

As informações neste documento são baseadas nestas versões de software e hardware:

- Hardware SPINE - 9336C-FX que executa a versão 10.2(2)
- Hardware LEAF - 93240YC-FX2 que executa a versão 10.2(2)
- CLIENTE - 92160YC-X (Host-1), Catalyst-3850 (Host-2)

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. Se a rede estiver ativa, certifique-se de que você entenda o impacto potencial de qualquer comando.

Informações de Apoio

Recapitulação MPLS L3VPN

Uma VPN é:

- Uma rede baseada em IP que fornece serviços de rede privada em uma infraestrutura pública.
- Um conjunto de sites que têm permissão para se comunicar de forma privada pela Internet ou por outras redes públicas ou privadas.

As VPNs convencionais são criadas pela configuração de uma malha completa de túneis ou circuitos virtuais permanentes (PVCs) para todos os locais em uma VPN. Esse tipo de VPN não é fácil de manter ou expandir, pois a adição de um novo local exige uma alteração em cada dispositivo de borda na VPN.

As VPNs baseadas em MPLS são criadas na camada 3 e são baseadas no modelo de peer. O modelo de peer permite que o provedor de serviços e o CE troquem informações de roteamento de Camada 3. O provedor de serviços retransmite os dados entre os sites CE sem o envolvimento do CE.

As VPNs MPLS são mais fáceis de gerenciar e expandir do que as VPNs convencionais. Quando um novo local é adicionado a uma VPN MPLS, somente o roteador de borda do provedor de serviços que fornece serviços ao local do cliente precisa ser atualizado.

Estes são os componentes da VPN MPLS:

- Roteador do provedor (P) - Roteador no núcleo da rede do provedor. Os roteadores PE executam switching MPLS e não anexam rótulos de VPN aos pacotes roteados. Os rótulos de VPN são usados para direcionar pacotes de dados para a rede privada ou o roteador de borda CE correto.

- Roteador PE (Provider Edge) - Roteador que conecta o rótulo VPN aos pacotes de entrada com base na interface ou subinterface na qual eles são recebidos e também conecta os rótulos do núcleo MPLS. Um roteador PE se conecta diretamente a um roteador.

- Roteador do cliente (C) - Roteador no provedor de serviços de Internet (ISP) ou na rede corporativa.

- Roteador Customer Edge (CE) - Roteador de borda na rede do ISP que se conecta ao roteador PE na rede. Um roteador CE deve fazer interface com um roteador PE.

Visão geral do EVPN com L3VPN (MPLS SR)

As implantações de data center (DC) adotaram EVPN de LAN extensível virtual (VXLAN) ou EVPN MPLS para seus benefícios, como aprendizagem de plano de controle de EVPN, multilocação, mobilidade contínua, redundância e adições de POD mais fáceis. Da mesma forma, o CORE é uma rede MPLS L3VPN baseada no Label Distribution Protocol (LDP) ou uma transição da base tradicional MPLS L3VPN LDP para uma solução mais sofisticada como SR.

A RE é adotada por seus benefícios, como:

- Unified Interior Gateway Protocol (IGP) e planos de controle MPLS
- Métodos de engenharia de tráfego mais simples
- Configuração mais fácil
- Adoção de redes definidas por software (SDN)

EVPN (RFC 7432) é uma solução baseada em BGP MPLS que foi usada para serviços Ethernet de próxima geração em uma rede de data center virtualizada. Ela usa vários blocos, como Rota.

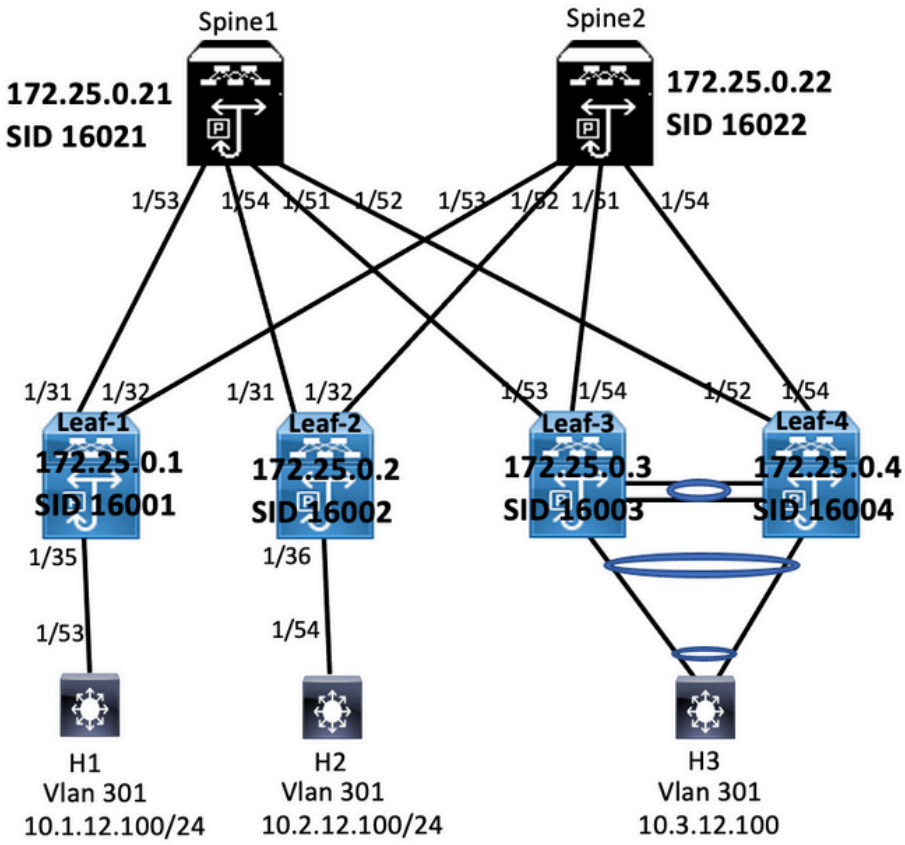
Distinguisher (RD), Route Target (RT) e Virtual Routing and Forwarding (VRF) das tecnologias MPLS existentes.

EVPN L3 sobre SR que foi introduzido na versão NXOS 7.0(3)I6(1) usa a rota EVPN Tipo 5 com encapsulamento MPLS. Ele oferece vários usuários, escalabilidade e alto desempenho para serviços de data center evoluídos.

Note: No DC, o plano de dados pode ser VXLAN ou MPLS.

VPN MPLS L3 tradicional	VPN MPLS L3 sobre SR
Blocos de construção principais: RD, RT e VRF	Blocos de construção principais: RD, RT e VF
Camada subjacente para transporte: IGP, LDP e RSVP-TE	Camada subjacente para transporte: IGP/BG
Camada de sobreposição para serviço: VPNv4 e VPNv6	Camada de sobreposição para serviço: EVPN

Diagrama de Rede



Configuração de alto nível

1. Instalar recursos
2. Configurar o endereço IP - Subjacente
3. Configurar IGP/MP - BGP
4. Configurar a sobreposição de VLAN e EVPN
5. Configurar o e-BGP entre hosts e LEAFs

Leaf-1

Enabling Features

```
install feature-set mpls
feature-set mpls
feature bgp
feature mpls segment-routing
feature mpls evpn
feature interface-vlan
feature lacp
feature mpls oam
feature mpls segment-routing traffic-engineering
vlan 1,301-310
segment-routing
 mpls
  global-block 16000 24000
  connected-prefix-sid-map
   address-family ipv4
172.25.0.1/32 absolute 16001
ip prefix-list node-sid-loopback seq 10 permit 172.25.0.1/32
ip as-path access-list LOCALLY-ORIGINATE seq 1 permit "^65534"
ip as-path access-list LOCALLY-ORIGINATE seq 2 permit "^$"
route-map NODE-SID-MED permit 10
 match ip address prefix-list node-sid-loopback
 set metric 100
route-map NODE-SID-MED permit 20
route-map SET_NH permit 5


 match community MATCH-65534:65534.
set ip next-hop unchanged
route-map SET_NH permit 10
 match as-path LOCALLY-ORIGINATE
set ip next-hop 172.25.0.1

vrf context VPN-A
 rd auto
 address-family ipv4 unicast
  route-target import 301:301
  route-target import 301:301 evpn
  route-target export 301:301
  route-target export 301:301 evpn
vrf context VPN-B
 rd auto
 address-family ipv4 unicast
  route-target import 302:302
  route-target import 302:302 evpn
  route-target export 302:302
  route-target export 302:302 evpn
```

Interface Configuration

```
interface Vlan301
 ip access-group deny-to-core_ra in
 vrf member VPN-A
 no ip redirects
 ip address 10.1.12.1/24
 ip directed-broadcast ip-dir-bcast
 ip arp timeout 720

interface Vlan302
 ip access-group deny-to-core_ra in
 vrf member VPN-B
 no ip redirects
 ip address 10.1.13.1/24
 ip directed-broadcast ip-dir-bcast
 ip arp timeout 720

interface Ethernet1/31
 description connected to spine1 - 1/53 - 192.168.1.10
 mtu 9216
 logging event port link-status
 no ip redirects
 ip address 192.168.1.9/30
 ip arp timeout 14400
 mpls ip forwarding


interface Ethernet1/32
 description connected to spine2 - 1/53 - 192.168.1.14
 mtu 9216
 logging event port link-status
 no ip redirects
 ip address 192.168.1.13/30
 ip arp timeout 14400
 mpls ip forwarding
 no shutdown

interface Ethernet1/35
 switchport
 switchport mode trunk
 switchport trunk allowed vlan 301-310
 no shutdown

interface loopback0
 ip address 172.25.0.1/32
no shut
```

BGP/EVPN Configuration

```
router bgp 65534
 router-id 172.25.0.1
 disable-policy-batching
 bestpath as-path multipath-relax
 bestpath med missing-as-worst
 log-neighbor-changes
 event-history detail size large
 nexthop suppress-default-resolution
 address-family ipv4 unicast
  network 172.25.0.1/32
  maximum-paths 4
  maximum-paths ibgp 4
  allocate-label route-map node-sid-label
 address-family ipv4 labeled-unicast
  prefix-priority high
 address-family l2vpn evpn
 template peer EBGP-SPINE
  remote-as 64087
  description EBGP-PEERING-to-AGG
  address-family ipv4 unicast
   allowas-in 1
   send-community
   send-community extended
   route-map NODE-SID-MED out


no advertise local-labeled-route
   soft-reconfiguration inbound
  address-family ipv4 labeled-unicast
   allowas-in 1
   send-community
   send-community extended
   route-map NODE-SID-MED out
   soft-reconfiguration inbound always
  address-family l2vpn evpn
   allowas-in 1
   send-community
   send-community extended
   filter-list LOCALLY-ORIGINATE out
   route-map SET_NH out
   encapsulation mpls
 neighbor 192.168.1.10
  inherit peer EBGP-SPINE
 neighbor 192.168.1.14
  inherit peer EBGP-SPINE
```

```
vrf VPN-A
 bestpath as-path multipath-relax
 allocate-index 2001
 address-family ipv4 unicast
  network 10.1.12.0/24
  advertise l2vpn evpn
  maximum-paths 4
vrf VPN-B
 bestpath as-path multipath-relax
 allocate-index 2002
 address-family ipv4 unicast
  network 10.1.13.0/24
  advertise l2vpn evpn
  maximum-paths 4
```

Leaf-2

Enabling Features

```
install feature-set mpls
feature-set mpls
feature bgp
feature mpls segment-routing
feature mpls evpn
feature interface-vlan
feature lacp
feature mpls oam
feature mpls segment-routing traffic-engineering
vlan 1,301-310
segment-routing
 mpls
  global-block 16000 24000
  connected-prefix-sid-map
   address-family ipv4
    172.25.0.2/32 absolute 16002
ip prefix-list node-sid-loopback seq 10 permit 172.25.0.2/32
ip as-path access-list LOCALLY-ORIGINATE seq 1 permit "^65534"
ip as-path access-list LOCALLY-ORIGINATE seq 2 permit "^$"
route-map NODE-SID-MED permit 10
 match ip address prefix-list node-sid-loopback
 set metric 100
route-map NODE-SID-MED permit 20
route-map SET_NH permit 5


match community MATCH-65534:65534
 set ip next-hop unchanged
route-map SET_NH permit 10
 match as-path LOCALLY-ORIGINATE
 set ip next-hop 172.25.0.2
vrf context VPN-A
 rd auto
 address-family ipv4 unicast
  route-target import 301:301
  route-target import 301:301 evpn
  route-target export 301:301
  route-target export 301:301 evpn
vrf context VPN-B
 rd auto
 address-family ipv4 unicast
  route-target import 302:302
  route-target import 302:302 evpn
  route-target export 302:302
  route-target export 302:302 evpn
```

Interface Configuration

```
interface Vlan301
 no shutdown
 ip access-group deny-to-core_ra in
 vrf member VPN-A
 no ip redirects
 ip address 10.2.12.1/24
 ip directed-broadcast ip-dir-bcast
 ip arp timeout 720

interface Vlan302
 no shutdown
 ip access-group deny-to-core_ra in
 vrf member VPN-B
 no ip redirects
 ip address 10.2.13.1/24
 ip directed-broadcast ip-dir-bcast
 ip arp timeout 720

interface Ethernet1/3
 switchport
 switchport mode trunk
 switchport trunk allowed vlan 301-310
 no shutdown


 interface Ethernet1/31
 description connected to spine1 - 1/54 - 192.168.2.10
 mtu 9216
 logging event port link-status
 no ip redirects
 ip address 192.168.2.9/30
 ip arp timeout 14400
 mpls ip forwarding
interface Ethernet1/32
 description connected to Spine2 - 1/52 - 192.168.2.14
 mtu 9216
 logging event port link-status
 no ip redirects
 ip address 192.168.2.13/30
 ip arp timeout 14400
 mpls ip forwarding
interface Ethernet1/36
  switchport mode trunk
 switchport trunk allowed vlan 301-310
interface loopback0
 ip address 172.25.0.2/32
```

BGP/EVPN Configuration

```
router bgp 65534
 router-id 172.25.0.2
 disable-policy-batching
 bestpath as-path multipath-relax
 bestpath med missing-as-worst
 log-neighbor-changes
 event-history detail size large
 nexthop suppress-default-resolution
 address-family ipv4 unicast
  network 172.25.0.2/32
  maximum-paths 4
  maximum-paths ibgp 4
  allocate-label route-map node-sid-label
 address-family ipv4 labeled-unicast
  prefix-priority high
 address-family l2vpn evpn
 template peer EBGP-SPINE
  remote-as 64087
  description EBGP-PEERING-to-AGG
  address-family ipv4 unicast
   allowas-in 1
   send-community
   send-community extended
   route-map NODE-SID-MED out


no advertise local-labeled-route
   soft-reconfiguration inbound
  address-family ipv4 labeled-unicast
   allowas-in 1
   send-community
   send-community extended
   route-map NODE-SID-MED out
   soft-reconfiguration inbound always
  address-family l2vpn evpn
   allowas-in 1
   send-community
   send-community extended
   filter-list LOCALLY-ORIGINATE out
   route-map SET_NH out
   encapsulation mpls
 neighbor 192.168.2.10
  inherit peer EBGP-SPINE
 neighbor 192.168.2.14
  inherit peer EBGP-SPINE
```

```
vrf VPN-A
  bestpath as-path multipath-relax
  allocate-index 2001
  address-family ipv4 unicast
   network 10.2.12.0/24
   advertise l2vpn evpn
   maximum-paths 4
 vrf VPN-B
  bestpath as-path multipath-relax
  allocate-index 2002
  address-family ipv4 unicast
   network 10.2.13.0/24
   advertise l2vpn evpn
   maximum-paths 4
```

Spine-1

Enabling Features

```
install feature-set mpls
feature-set mpls
feature bgp
feature mpls segment-routing
feature mpls evpn
feature interface-vlan
feature lacp
feature mpls oam
feature mpls segment-routing traffic-engineering
vlan 1
segment-routing
  mpls
    global-block 16000 24000
    connected-prefix-sid-map
      address-family ipv4
        172.25.0.21/32 absolute 16021
ip prefix-list NH-RESTRICT seq 5 permit 0.0.0.0/0
ip prefix-list node-sid-loopback seq 5 permit 172.25.0.21/32
route-map NH-RESTRICT deny 10
  match ip address prefix-list NH-RESTRICT
route-map NH-RESTRICT permit 20
route-map NH_UNCHG permit 10
  set ip next-hop unchanged
```

Interface Configuration

```
interface Ethernet1/53
  description connected to Leaf1 - 1/31 - 192.168.1.9
  mtu 9216
  logging event port link-status
  no ip redirects
  ip address 192.168.1.10/30
  ip arp timeout 14400
  mpls ip forwarding
  no shutdown

interface Ethernet1/54
  description connected to Leaf2- 1/31 - 192.168.2.9
  mtu 9216
  logging event port link-status
  no ip redirects
  ip address 192.168.2.10/30
  ip arp timeout 14400
  mpls ip forwarding
  no shutdown


interface loopback0
  ip address 172.25.0.21/32
no shutdown
```

BGP/EVPN Configuration

```
router bgp 64087
  router-id 172.25.0.21
  bestpath as-path multipath-relax
  bestpath med missing-as-worst
  log-neighbor-changes
  nexthop suppress-default-resolution
  address-family ipv4 unicast
    network 172.25.0.21/32
    maximum-paths 4
    nexthop route-map NH-RESTRICT
    allocate-label route-map node-sid-label
  address-family ipv4 labeled-unicast
    prefix-priority high
  address-family l2vpn evpn
    retain route-target all
  template peer EBGP-ACCESS
    remote-as 65534
    description EBGP-PEERING-to-ACCESS
    address-family ipv4 unicast
      disable-peer-as-check
      send-community
      send-community extended
      default-originate
      no advertise local-labeled-route


  soft-reconfiguration inbound
    address-family ipv4 labeled-unicast
      disable-peer-as-check
      send-community
      send-community extended
      soft-reconfiguration inbound
    address-family l2vpn evpn
      disable-peer-as-check
      send-community
      send-community extended
      route-map NH_UNCHG out
      encapsulation mpls
  neighbor 192.168.1.9
    inherit peer EBGP-ACCESS
  neighbor 192.168.2.9
    inherit peer EBGP-ACCESS
```

Spine-2

Enabling Feature

```
install feature-set mpls
feature-set mpls
feature bgp
feature mpls segment-routing
feature mpls evpn
feature interface-vlan
feature lacp
feature mpls oam
feature mpls segment-routing traffic-engineering
vlan 1
segment-routing
  mpls
    global-block 16000 24000
    connected-prefix-sid-map
      address-family ipv4
        172.25.0.22/32 absolute 16021
ip prefix-list NH-RESTRICT seq 5 permit 0.0.0.0/0
ip prefix-list node-sid-loopback seq 5 permit 172.25.0.22/32
route-map NH-RESTRICT deny 10
  match ip address prefix-list NH-RESTRICT
route-map NH-RESTRICT permit 20
route-map NH_UNCHG permit 10
  set ip next-hop unchanged
```

Interface Configuration

```
interface Ethernet1/52
  description connected to Leaf2 - 1/31 - 192.168.2.13
  mtu 9216
  logging event port link-status
  no ip redirects
  ip address 192.168.2.14/30
  ip arp timeout 14400
  mpls ip forwarding
  no shutdown

interface Ethernet1/53
  description connected to Leaf2- 1/32 - 192.168.1.13
  mtu 9216
  logging event port link-status
  no ip redirects
  ip address 192.168.1.14/30
  ip arp timeout 14400
  mpls ip forwarding
  no shutdown


interface loopback0
  ip address 172.25.0.22/32
no shut
```

BGP/EVPN Configuration

```
router bgp 64087
  router-id 172.25.0.22
  bestpath as-path multipath-relax
  bestpath med missing-as-worst
  log-neighbor-changes
  nexthop suppress-default-resolution
  address-family ipv4 unicast
    network 172.25.0.22/32
    maximum-paths 4
    nexthop route-map NH-RESTRICT
    allocate-label route-map node-sid-label
  address-family ipv4 labeled-unicast
    prefix-priority high
  address-family l2vpn evpn
    retain route-target all
  template peer EBGP-ACCESS
    remote-as 65534
    description EBGP-PEERING-to-ACCESS
    address-family ipv4 unicast
      disable-peer-as-check
      send-community
      send-community extended
      default-originate
      no advertise local-labeled-route

  soft-reconfiguration inbound
    address-family ipv4 labeled-unicast
      disable-peer-as-check
      send-community
      send-community extended
      soft-reconfiguration inbound
    address-family l2vpn evpn
      disable-peer-as-check
      send-community
      send-community extended
      route-map NH_UNCHG out
      encapsulation mpls
  neighbor 192.168.1.13
    inherit peer EBGP-ACCESS
  neighbor 192.168.2.13
    inherit peer EBGP-ACCESS
```

Host-1 Configuration

```
install feature-set mpls
feature mpls
interface Ethernet1/53
switchport
switchport mode trunk
switchport trunk allowed vlan 301-310
no shut

interface vlan 301
no shutdown
no ip redirects
ip address 10.1.12.100/24
ip directed-broadcast ip-dir-bcast
ip arp timeout 720
```

Host-2 Configuration

```
install feature-set mpls
feature mpls
interface Ethernet1/54
switchport
switchport mode trunk
switchport trunk allowed vlan 301-310
no shut

interface vlan 301
no shutdown
no ip redirects
ip address 10.2.12.100/24
ip directed-broadcast ip-dir-bcast
ip arp timeout 720
```

Verificar

Use esta seção para confirmar se a sua configuração funciona corretamente.

```
H1(config)# show ip int brief

IP Interface Status for VRF "default"(1)
Interface         IP Address      Interface Status
Vlan301           10.1.12.100     protocol-up/link-up/admin-up

H1(config)# ping 10.2.12.100
PING 10.2.12.100 (10.2.12.100): 56 data bytes
64 bytes from 10.2.12.100: icmp_seq=0 ttl=251 time=0.994 ms
64 bytes from 10.2.12.100: icmp_seq=1 ttl=251 time=0.586 ms
64 bytes from 10.2.12.100: icmp_seq=2 ttl=251 time=0.677 ms
64 bytes from 10.2.12.100: icmp_seq=3 ttl=251 time=0.615 ms
64 bytes from 10.2.12.100: icmp_seq=4 ttl=251 time=0.597 ms

--- 10.2.12.100 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.586/0.693/0.994 ms
```

```
H2(config)# show ip int brief

IP Interface Status for VRF "default"(1)
Interface         IP Address      Interface Status
Vlan301           10.2.12.100     protocol-up/link-up/admin-up

H2(config)# ping 10.1.12.100
PING 10.1.12.100 (10.1.12.100): 56 data bytes
64 bytes from 10.1.12.100: icmp_seq=0 ttl=251 time=1.043 ms
64 bytes from 10.1.12.100: icmp_seq=1 ttl=251 time=1.933 ms
64 bytes from 10.1.12.100: icmp_seq=2 ttl=251 time=0.865 ms
64 bytes from 10.1.12.100: icmp_seq=3 ttl=251 time=0.668 ms
64 bytes from 10.1.12.100: icmp_seq=4 ttl=251 time=0.713 ms

--- 10.1.12.100 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.668/1.044/1.933 ms
```

Troubleshoot

Esta seção fornece informações que podem ser usadas para o troubleshooting da sua configuração.

```
spine1(config-router-af)# 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
16001     Pop Label  172.25.0.1/32   Eth1/53          10.1.1.9
16002     Pop Label  172.25.0.2/32   Eth1/54          10.2.1.9

In-Label  VRF
492287    default



Block     Label-Range
1         16000 - 24000
```

```
spine1(config-router-af)# show bgp l2vpn evpn
BGP routing table information for VRF default, address family L2VPN EVPN
BGP table version is 17, Local Router ID is 172.25.0.21

  Network          Next Hop          Metric     LocPrf     Weight Path
Route Distinguisher: 172.25.0.1:3
*>e[5]:[0]:[0]:[24]:[12.1.12.0]/224
                   172.25.0.1        4294967295                0 65534 i

Route Distinguisher: 172.25.0.1:4
*>e[5]:[0]:[0]:[24]:[12.1.13.0]/224
                   172.25.0.1        4294967295                0 65534 i

Route Distinguisher: 172.25.0.2:3
*>e[5]:[0]:[0]:[24]:[10.2.12.0]/224
                   172.25.0.2        4294967295                0 65534 i

Route Distinguisher: 172.25.0.2:4
*>e[5]:[0]:[0]:[24]:[10.2.13.0]/224
                   172.25.0.2        4294967295                0 65534 i
```

```
ping 10.1.12.200
PING 10.1.12.200 (10.1.12.200): 56 data bytes
64 bytes from 10.1.12.200: icmp_seq=0 ttl=254 time=1.14 ms
64 bytes from 10.1.12.200: icmp_seq=1 ttl=254 time=0.687 ms
64 bytes from 10.1.12.200: icmp_seq=2 ttl=254 time=0.658 ms
64 bytes from 10.1.12.200: icmp_seq=3 ttl=254 time=0.636 ms
64 bytes from 10.1.12.200: icmp_seq=4 ttl=254 time=0.699 ms
--- 10.1.12.200 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.636/0.763/1.14 ms

H1# show ip int brie
IP Interface Status for VRF "default"(1)
Interface            IP Address      Interface Status
Vlan301              10.1.12.100     protocol-up/link-up/admin-up

H1# show mac address-table
Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link,
        (T) - True, (F) - False, C - ControlPlane MAC, ~ - vsan
   VLAN     MAC Address      Type      age     Secure NTFY Ports
---------+-----------------+--------+---------+------+----+------------------
*  301     0000.0000.1111   dynamic  0         F      F    Po30
*  301     00ea.bd27.86ef   dynamic  0         F      F    Po30
G    -     00ea.bd27.6285   static   -         F      F    sup-eth1(R)
G  301     00ea.bd27.6285   static   -         F      F    sup-eth1(R)

H2# show ip interface brief
Interface            IP Address      Interface Status
Vlan301              10.1.12.200     protocol-up/link-up/admin-up
H3# ping 10.1.12.100
PING 10.1.12.100 (10.1.12.100): 56 data bytes
64 bytes from 10.1.12.100: icmp_seq=0 ttl=254 time=1.211 ms
64 bytes from 10.1.12.100: icmp_seq=1 ttl=254 time=0.694 ms
64 bytes from 10.1.12.100: icmp_seq=2 ttl=254 time=0.68 ms
64 bytes from 10.1.12.100: icmp_seq=3 ttl=254 time=0.673 ms
64 bytes from 10.1.12.100: icmp_seq=4 ttl=254 time=0.624 ms
--- 10.1.12.100 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.624/0.776/1.211 ms
H3# show int vlan 301
Vlan301 is up, line protocol is up, autostate enabled
  Hardware is EtherSVI, address is  00ea.bd27.86ef
 H3# show mac address-table
Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link,
   VLAN     MAC Address      Type      age     Secure NTFY Ports
---------+-----------------+--------+---------+------+----+------------------
*  301     0000.0000.1111   dynamic  0         F      F    Eth1/33
*  301     00ea.bd27.6285   dynamic  0         F      F    Eth1/33
G    -     00ea.bd27.86ef   static   -         F      F    sup-eth1(R)
G  301     00ea.bd27.86ef   static   -         F      F    sup-eth1(R)

spine-1# show bgp l2vpn evpn
BGP routing table information for VRF default, address family L2VPN EVPN
BGP table version is 188, Local Router ID is 172.25.0.21
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-i
njected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - Network
Next Hop            Metric     LocPrf     Weight Path
Route Distinguisher: 172.25.0.1:5
*>e[5]:[0]:[0]:[24]:[10.1.12.0]/224
                    172.25.0.15    4294967295                 0 65534 i
Route Distinguisher: 172.25.0.1:37164
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[0]:[0.0.0.0]/216
                    172.25.0.15    4294967295                 0 65534 i
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[32]:[10.1.12.100]/272
                    172.25.0.15    4294967295                 0 65534 i
*>e[3]:[0]:[32]:[172.25.0.15]/88
                    172.25.0.15    4294967295                 0 65534 i
Route Distinguisher: 172.25.0.2:37164
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[0]:[0.0.0.0]/216
                    172.25.0.15    4294967295                 0 65534 i
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[32]:[10.1.12.100]/272
                    172.25.0.15    4294967295                 0 65534 i
*>e[3]:[0]:[32]:[172.25.0.15]/88
                    172.25.0.15    4294967295                 0 65534 i



Route Distinguisher: 172.25.0.3:37164
*>e[2]:[0]:[0]:[48]:[00ea.bd27.86ef]:[0]:[0.0.0.0]/216
                    172.25.0.3     4294967295                 0 65534 i
*>e[2]:[0]:[0]:[48]:[00ea.bd27.86ef]:[32]:[10.1.12.200]/272
                    172.25.0.3     4294967295                 0 65534 i
*>e[3]:[0]:[32]:[172.25.0.3]/88
                    172.25.0.3     4294967295                 0 65534 i

spine-1# show ip int bri

IP Interface Status for VRF "default"(1)
Interface            IP Address      Interface Status
Lo0                  172.25.0.21     protocol-up/link-up/admin-up
Eth1/45              192.168.1.10    protocol-up/link-up/admin-up
Eth1/46              192.168.2.10    protocol-up/link-up/admin-up
Eth1/52              192.168.3.10    protocol-up/link-up/admin-up
spine-1#

BGP routing table information for VRF default, address family L2VPN EVPN
BGP table version is 188, Local Router ID is 172.25.0.22
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-i
njected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - b
Network            Next Hop            Metric     LocPrf     Weight Path
Route Distinguisher: 172.25.0.1:5
*>e[5]:[0]:[0]:[24]:[12.1.12.0]/224
                    172.25.0.15    4294967295                 0 65534 i

Route Distinguisher: 172.25.0.1:37164
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[0]:[0.0.0.0]/216
                    172.25.0.15    4294967295                 0 65534 i
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[32]:[10.1.12.100]/272
                    172.25.0.15    4294967295                 0 65534 i
*>e[3]:[0]:[32]:[172.25.0.15]/88
                    172.25.0.15    4294967295                 0 65534 i

Route Distinguisher: 172.25.0.2:37164
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[0]:[0.0.0.0]/216
                    172.25.0.15    4294967295                 0 65534 i
*>e[2]:[0]:[0]:[48]:[00ea.bd27.6285]:[32]:[10.1.12.100]/272

Route Distinguisher: 172.25.0.3:37164
*>e[2]:[0]:[0]:[48]:[00ea.bd27.86ef]:[0]:[0.0.0.0]/216
                    172.25.0.3     4294967295                 0 65534 i
*>e[2]:[0]:[0]:[48]:[00ea.bd27.86ef]:[32]:[10.1.12.200]/272
                    172.25.0.3     4294967295                 0 65534 i
*>e[3]:[0]:[32]:[172.25.0.3]/88
                    172.25.0.3     4294967295                 0 65534 i

spine2# show ip int brie

IP Interface Status for VRF "default"(1)
Interface            IP Address      Interface Status
Lo0                  172.25.0.22     protocol-up/link-up/admin-up
Eth1/47              192.168.1.14    protocol-up/link-up/admin-up
Eth1/48              192.168.2.14    protocol-up/link-up/admin-up
Eth1/53              192.168.3.14    protocol-up/link-up/admin-up
spine2#
```

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