

Implementieren von Nexus L2 EVPN über Segment Routing MPLS

Inhalt

[Einführung](#)

[Voraussetzungen](#)

[Anforderungen](#)

[Verwendete Komponenten](#)

[Hintergrund](#)

[Konfigurieren](#)

[Netzwerkdigramm](#)

[Überprüfung](#)

[Referenzen](#)

Einführung

Dieses Dokument beschreibt die Bereitstellung/Konfiguration von Layer-2-EVPN über Segment Routing MPLS auf Cisco Nexus Switches der Serie 9000.

Voraussetzungen

Anforderungen

Kenntnisse über BGP, OSPF, MPLS, LDP, RSVP, EVPN, Segment Routing (SR) erforderlich

Verwendete Komponenten

Cisco Nexus Switch 9360YC-FX2 mit 9.3.(3)

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

Die Informationen in diesem Dokument wurden von den Geräten in einer bestimmten Laborumgebung erstellt. Alle in diesem Dokument verwendeten Geräte haben mit einer leeren (Standard-)Konfiguration begonnen. Wenn Ihr Netzwerk in Betrieb ist, stellen Sie sicher, dass Sie die potenziellen Auswirkungen eines Befehls verstehen.

Hintergrund

Definieren Sie Layer-2-VPN, VPLS/L2-EVPN ist ein Multipoint-to-Multipoint-Layer-2-VPN-Service, der mehrere Zweigstellen eines Kunden in einer einzigen logischen Switch-Architektur über ein IP/MPLS-Netzwerk verbindet.

Layer-2-EVPN-MPLS-SR:

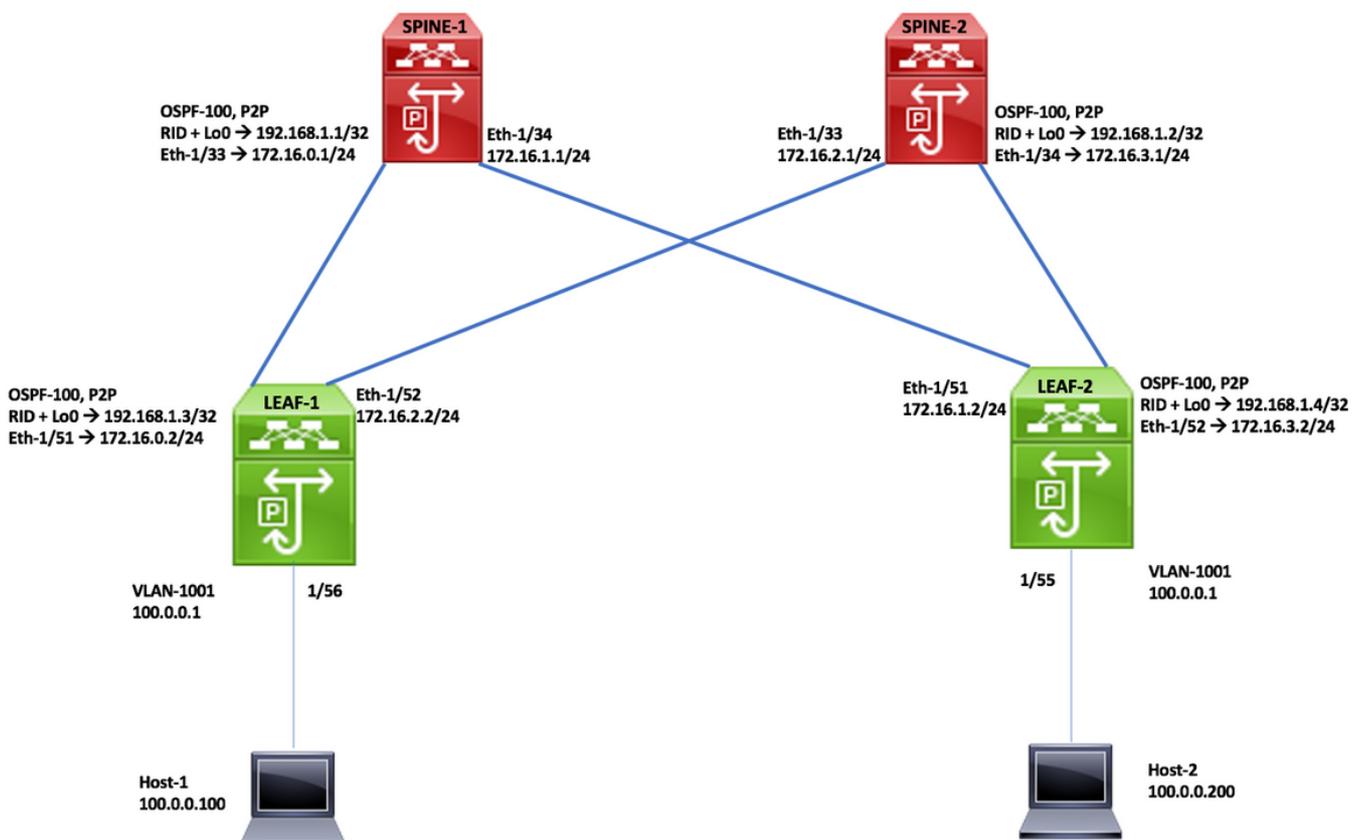
- EVPN (RFC 7432) ist eine MPLS-basierte BGP-Lösung, die für Ethernet-Services der nächsten Generation im virtualisierten Rechenzentrumsnetzwerk verwendet wird.
- EVPN verwendet verschiedene Bausteine wie RD, RT und VRF aus vorhandenen MPLS-Technologien.
- EVPN arbeitet im Gegensatz zu dem vorhandenen VPLS, indem es im Kern ein Kontrollebenen-basiertes MAC-Learning ermöglicht.
- In EVPN erfassen PEs, die an den EVPN-Instanzen teilnehmen, MAC-Routen der Kunden auf Kontrollebene mithilfe des MP-BGP-Protokolls.
- Das MAC-Learning auf Kontrollebene bietet eine Reihe von Vorteilen, die es EVPN ermöglichen, die VPLS-Mängel zu beheben, einschließlich Unterstützung für Multihoming mit Lastenausgleich pro Datenstrom
- SR L2 EVPN ist eine neue Funktion, die in NXOS 9.3(1) verfügbar ist und auf der Plattform der Nexus Serie 9300 FX2 unterstützt wird.

Einschränkungen für L2 EVPN über SR MPLS:

- EVPN-Flooding für Layer-2-Segmentrouting basiert auf dem Eingangs-Replikationsmechanismus.
- Es verwendet die EVPN-Route des Typs 3 für den BUM-Datenverkehr.
- Multicast wird nicht vom MPLS-Core unterstützt.
- ARP-Unterdrückung wird nicht unterstützt
- Konsistenzprüfung auf VPC wird nicht unterstützt
- Dasselbe L2 EVI und L3 EVI können nicht zusammen konfiguriert werden.

Konfigurieren

Netzwerkdiagramm



Allgemeine Konfigurationsschritte:

- Installationsfunktionen
- Konfigurieren der IP-Adresse - Underlay
- Konfigurieren von IGP - OSPF
- Konfigurieren von MP-BGP
- VLAN- und EVPN-Overlay konfigurieren
- Konfigurieren des Endhosts für Layer 2

SPINE -1 Configuration		
Enabling Features, Label-Range, Route-map, Label-Index	OSPF Configuration	BGP/EVPN Configuration
install feature-set mpls	interface Ethernet1/33	router bgp 65001
feature-set mpls	ip address 172.16.0.1/24	router-id 192.168.1.1
feature ospf	ip ospf network point-to-point	address-family ipv4 unicast
feature bgp	ip router ospf 100 area 0.0.0.0	network 192.168.1.1/32 route-map label-index-spine1
feature mpls segment-routing	mpls ip forwarding	allocate-label all
feature mpls evpn	no shutdown	address-family ipv4 labeled-unicast
feature interface-vlan	interface Ethernet1/34	address-family I2vpn evpn
feature mpls oam	ip address 172.16.1.1/24	template peer EVPN
mpls label range 5000 450000	ip ospf network point-to-point	remote-as 65001
segment-routing	ip router ospf 100 area 0.0.0.0	update-source loopback0
mpls	mpls ip forwarding	address-family I2vpn evpn
global-block 16000 25000	no shutdown	send-community extended
connected-prefix-sid-map	interface loopback0	route-reflector-client
address-family ipv4	ip address 192.168.1.1/32	encapsulation mpls
192.168.1.1/32 index 211	ip router ospf 100 area 0.0.0.0	template peer Labeled-unicast
route-map label-index-spine1 permit 10	router ospf 100	remote-as 65001
set label-index 211	segment-routing mpls	address-family ipv4 labeled-unicast
	router-id 192.168.1.1	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

```
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
```

OSPF Configuration

```
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
```

BGP/EVPN Configuration

```
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
```

Überprüfung

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

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 192.168.1.3:37864 (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					
*>[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	
*>[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.fafd]:[32]:[100.0.0.100]/248	192.168.1.4	100	0	i	
*>[3]:[0]:[32]:[192.168.1.4]/88	192.168.1.4	100	0	i	
*>[3]:[0]:[32]:[192.168.1.4]/88	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, I-injected
Origin codes: i - IGP, e - EGP, ? - incomplete, | - multipath, & - backup, 2 - best2
```

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 192.168.1.3:37864					
*>[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.fb4b]:[0]:[0.0.0.0]/216	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	
*>[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	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					
*>[2]:[0]:[0]:[48]:[00ee.ab39.fafd]:[32]:[100.0.0.100]/248	192.168.1.4	100	32768	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	

Referenzen

[Segment Routing auf Cisco Nexus 9500-, 9300-, 9200-, 3200- und 3100-Plattform-Switches \(Whitepaper\)](#)

[Konfigurieren von Layer-2-EVPN über Segment-Routing-MPLS](#)