

# Catalyst 9000 스위치에서 서비스 VRF EVPN VxLAN 구성

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## 소개

이 문서에서는 다양한 시나리오에서 EVPN(이더넷 VPN) VxLAN(Virtual Extensible LAN)의 경로 유출 컨피그레이션에 대해 설명합니다.

## 사전 요구 사항

유니캐스트 EVPN VxLAN 기능인 BGP에 익숙한 것이 좋습니다.

### 요구 사항

이 가이드에서는 BGP, NVE 피어가 이미 올바르게 작동한다고 가정합니다. 기본 EVPN VxLAN 작동(유니캐스트 ping 실패, BGP, NVE 피어 중단 등)에 문제가 있는 경우 필요에 따라 BGP, EVPN, 경로/스위치 문제 해결 가이드를 참조하십시오.

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참고: 서비스 VRF 컨피그레이션 예는 IPv4에서만 지원됩니다.

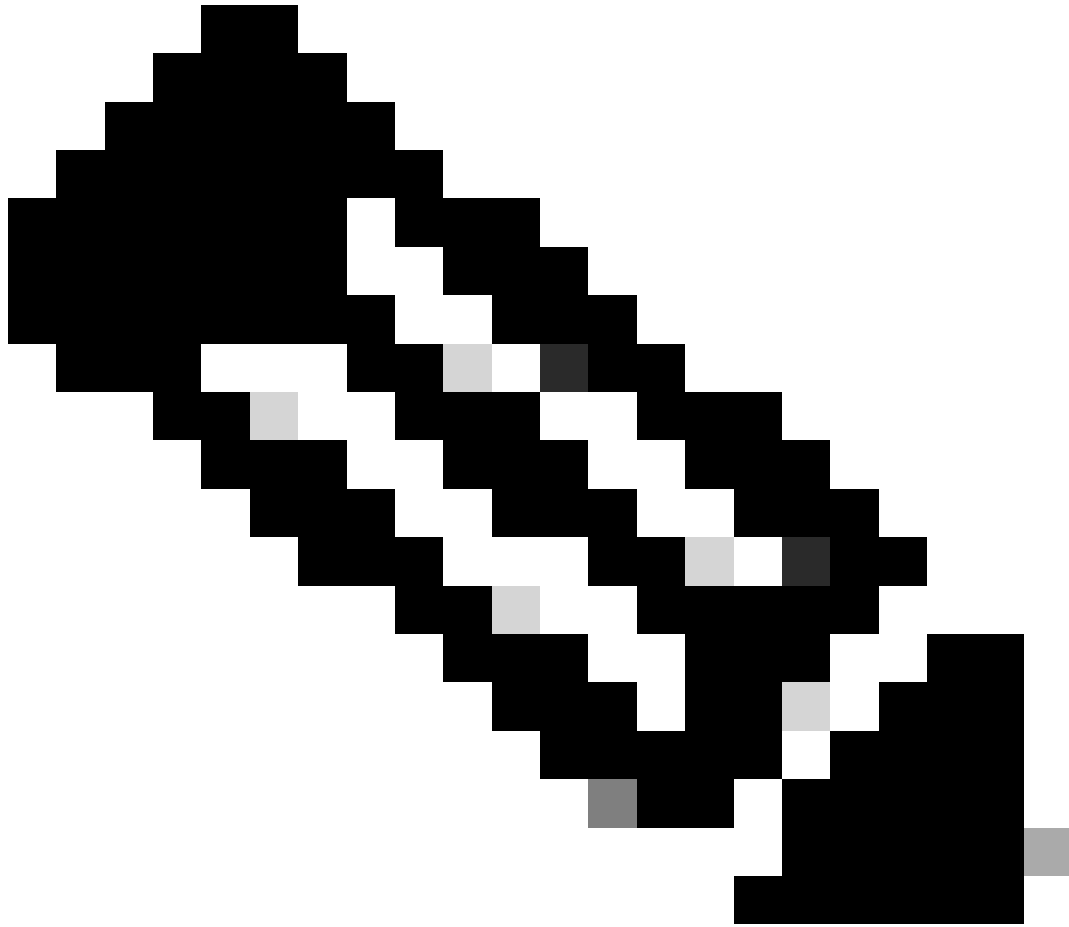
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## 사용되는 구성 요소

이 문서의 정보는 다음 소프트웨어 및 하드웨어 버전을 기반으로 합니다.

- C9300
- C9400
- C9500
- C9600

이 문서의 정보는 특정 랩 환경의 디바이스를 토대로 작성되었습니다. 이 문서에 사용된 모든 디바이스는 초기화된(기본) 컨피그레이션으로 시작되었습니다. 현재 네트워크가 작동 중인 경우 모든 명령의 잠재적인 영향을 미리 숙지하시기 바랍니다.



참고: 다른 Cisco 플랫폼에서 이러한 기능을 활성화하는 데 사용되는 명령은 해당 설정 가이드를 참조하십시오.

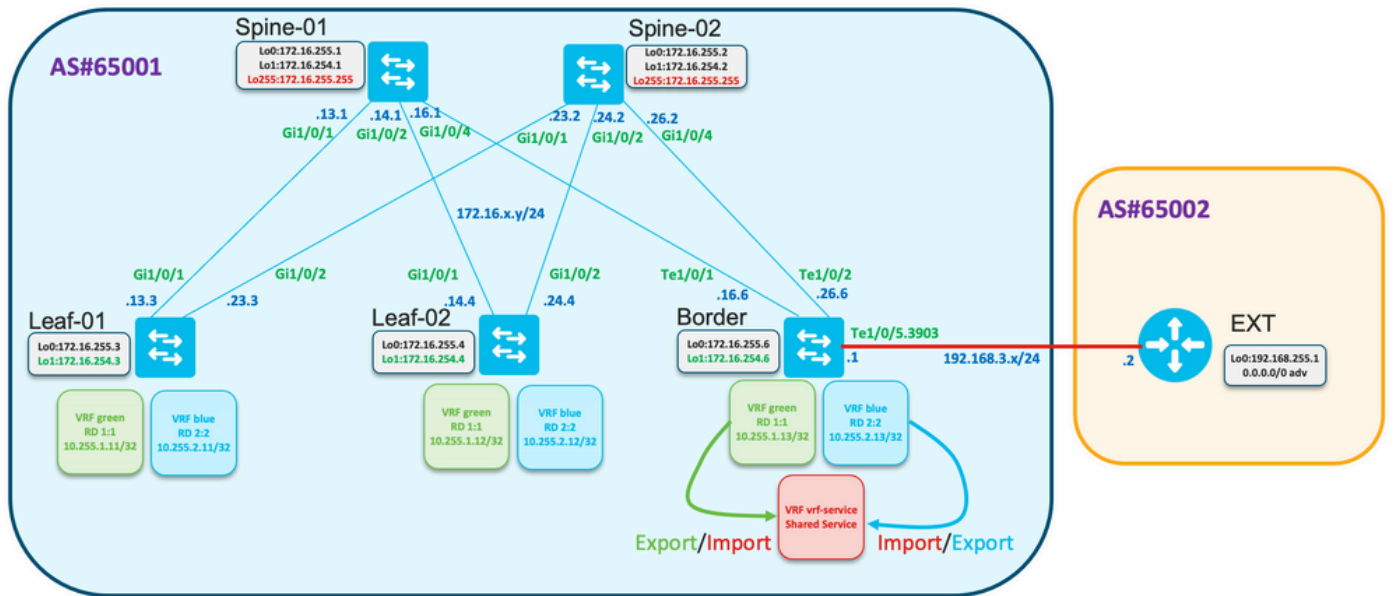
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## 구성

경로 유출 기능은 "공유 VRF" 서비스를 구축하거나 방화벽에 대한 Border Node를 연결할 때 널리 사용됩니다. 일반적으로 Border Leaf는 경로 유출이 구성된 노드입니다.

- Cisco IOS® XE의 EVPN/VXLAN에 대한 VRF 간 경로 유출은 BGP 레벨에서 기존과 같이 수행되지 않습니다. EVN(Easy Virtual Network) 기능이 대신 사용됩니다.

## 네트워크 다이어그램



## 일반 경로 유출

이 예에서는 VRF "green" 및 "blue"에서 VRF "vrf-service"로의 경로 유출을 Border 노드에 구성합니다.

Border(보더)에서 라우팅 테이블에서 VRF "green(녹색)" 및 "blue(파란색)"를 확인합니다.

```
<#root>
```

```
Border#
```

```
show ip route vrf green
```

```
<...snip...>
```

```

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
B    10.1.1.0/24 [200/0] via 172.16.254.3, 01:19:43, Vlan901
B    10.1.2.0/24 [200/0] via 172.16.254.3, 01:19:43, Vlan901
B    10.255.1.11/32 [200/0] via 172.16.254.3, 01:19:43, Vlan901
B    10.255.1.12/32 [200/0] via 172.16.254.4, 01:19:43, Vlan901
C    10.255.1.13/32 is directly connected, Loopback11

```

```
Border#
```

```
show ip route vrf blue
```

```
<...snip...>
```

```

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
B    10.2.1.0/24 [200/0] via 172.16.254.3, 01:20:28, Vlan902
B    10.2.2.0/24 [200/0] via 172.16.254.3, 01:20:28, Vlan902
B    10.255.2.11/32 [200/0] via 172.16.254.3, 01:20:28, Vlan902
B    10.255.2.12/32 [200/0] via 172.16.254.4, 01:20:28, Vlan902
C    10.255.2.13/32 is directly connected, Loopback12

```

VRF "녹색"에서 VRF "vrf-service"로 모든 경로를 가져오는 컨피그레이션

```
<#root>
```

```
vrf definition vrf-service
rd 3:3
!
address-family ipv4

route-replicate from vrf green unicast all

route-target export 3:3
route-target import 3:3
exit-address-family
```

경계에 있는 VRF "vrf-service"의 라우팅 테이블에 VRF "green"의 경로가 포함되어 있는지 확인합니다.

```
<#root>
```

```
Border#
```

```
show ip route vrf vrf-service
```

```
Routing Table: vrf-service
```

```
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP
n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
H - NHRP, G - NHRP registered, g - NHRP registration summary
o - ODR, P - periodic downloaded static route, l - LISP
a - application route
+ - replicated route, % - next hop override, p - overrides from PfR
& - replicated local route overrides by connected
```

```
Gateway of last resort is not set
```

```
10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
```

```
B + 10.1.1.0/24 [200/0] via 172.16.254.3, 00:00:42, Vlan901
B + 10.1.1.11/32 [200/0] via 172.16.254.3, 00:00:28, Vlan901
B + 10.255.1.11/32 [200/0] via 172.16.254.3, 01:32:49, Vlan901
B + 10.255.1.12/32 [200/0] via 172.16.254.4, 01:32:49, Vlan901

C + 10.255.1.13/32 is directly connected, Loopback11
C 10.255.3.13/32 is directly connected, Loopback13
```

VRF "녹색"의 경로가 VRF "vrf-service"에 복제되고 라우팅 테이블에 "+"로 표시되는지 확인합니다.

필터링으로 경로 유출

경로 복제는 필터링으로 수행할 수 있습니다. 경로 맵은 이 용도로 사용됩니다.

접두사 10.255.2.12만 VRF "blue"에서 VRF "vrf-service"로 복제합니다.

```
ip prefix-list PL-BLUE-2-VRF-SERVICE permit 10.255.2.12/32
!
route-map RM-BLUE-2-VRF-SERVICE permit 10
match ip address prefix-list PL-BLUE-2-VRF-SERVICE
```

필터를 사용하여 복제 구성

<#root>

```
vrf definition vrf-service
rd 3:3
!
address-family ipv4

route-replicate from vrf green unicast all

route-replicate from vrf blue unicast all route-map RM-BLUE-2-VRF-SERVICE

route-target export 3:3
route-target import 3:3
exit-address-family
```

VRF "vrf-service"의 라우팅 테이블에는 VRF "blue"에서 시작되는 접두사 10.255.2.12/32이 포함되어 있습니다.

<#root>

Border#

```
show ip route vrf VRF-SERVICE
```

<...snip...>

```
10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
B + 10.1.1.0/24 [200/0] via 172.16.254.3, 00:09:38, Vlan901
B + 10.1.1.11/32 [200/0] via 172.16.254.3, 00:09:24, Vlan901
B + 10.255.1.11/32 [200/0] via 172.16.254.3, 01:41:45, Vlan901
B + 10.255.1.12/32 [200/0] via 172.16.254.4, 01:41:45, Vlan901
C + 10.255.1.13/32 is directly connected, Loopback11
B + 10.255.2.12/32 [200/0] via 172.16.254.4, 01:41:45, Vlan902 <--
C 10.255.3.13/32 is directly connected, Loopback13
```

## 기본 경로 알림만 및 기본 경로 추적

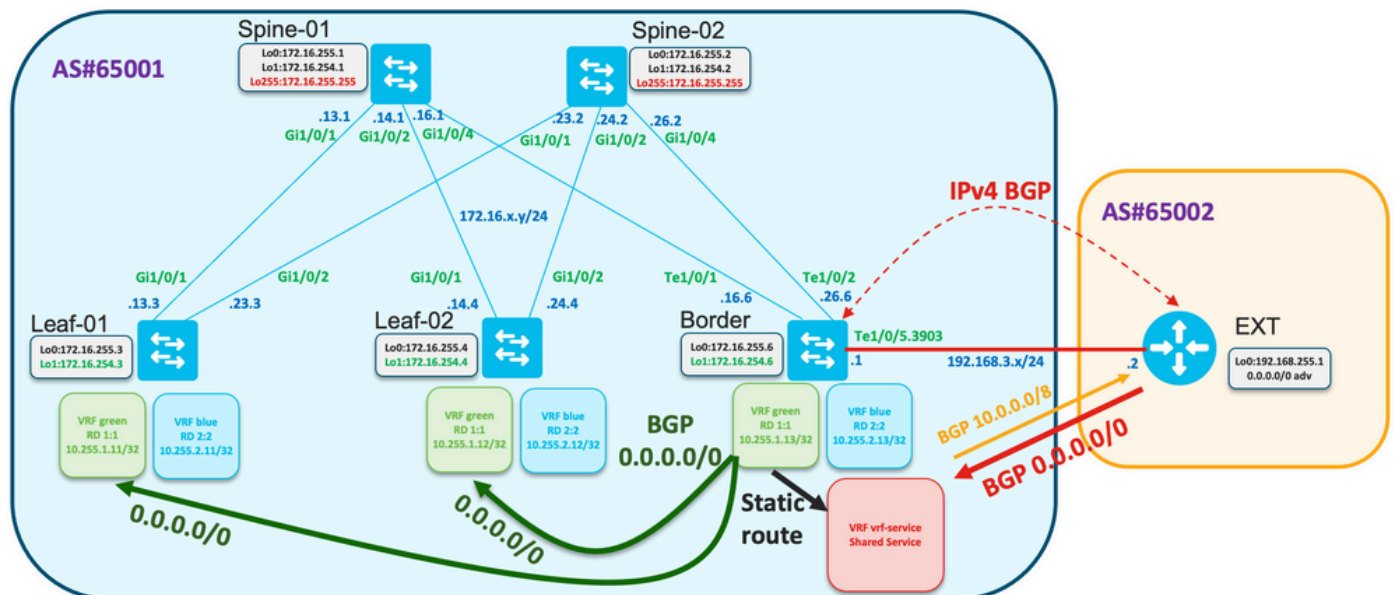
외부 네트워크를 사용하는 Leaf에 연결된 호스트 간의 연결은 Border를 통해 구축됩니다.

- 일반적으로 Border(경계)는 기본 경로만 수신하거나 기본 경로와 요약 경로를 수신합니다.
- Leaf에서 라우팅 테이블을 최적화하려면 Border에서 기본 경로만 광고할 수 있습니다.

기본 경로는 VRF "vrf-service"/"Shared service"에서 수신됩니다.

- 이 경로는 VRF "녹색"으로 복제할 수 있지만 복제된 경로는 다시 광고할 수 없습니다. VRF "녹색"에 대해 BGP에서 기본 경로 알림을 구성해야 합니다.
- VRF "녹색"의 기본 경로는 광고되지만 VRF "vrf-service"의 기본 경로는 존재하지 않을 때 블랙홀 상황을 피하도록 추적 객체가 있는 고정 경로를 구성할 수 있습니다.

## 토폴로지 검토



Border Node에서 기본 경로가 수신되는지 확인합니다.

```
<#root>
```

```
Border#
```

```
show ip route vrf vrf-service 0.0.0.0
```

```
Routing Table: red
```

```
Routing entry for 0.0.0.0/0, supernet
```

```
Known via "bgp 65001", distance 20, metric 0, candidate default path
```

```
Tag 65002, type external
```

```
Last update from 192.168.3.2 00:13:32 ago
```

```
Routing Descriptor Blocks:
```

```
* 192.168.3.2, from 192.168.3.2, 00:13:32 ago
```

```
opaque_ptr 0x7FA2A139FE50
```

```
Route metric is 0, traffic share count is 1
```

```
AS Hops 1
```

```
Route tag 65002
```

MPLS label: none

<#root>

Border#

```
show ip cef vrf vrf-service 0.0.0.0/0
```

0.0.0.0/0

```
  nexthop 192.168.3.2 TenGigabitEthernet1/0/5.3903
```

트랙 1은 VRF "vrf-service"에서 기본 경로의 연결성을 확인합니다.

```
track 1 ip route 0.0.0.0 0.0.0.0 reachability
ip vrf vrf-service
```

VRF "vrf-service"에 기본 경로가 있고 추적 객체가 "Up"인지 확인합니다.

<#root>

Border#

```
show track 1
```

Track 1

```
  IP route 0.0.0.0 0.0.0.0 reachability
```

```
  Reachability is Up (BGP)
```

```
    2 changes, last change 00:23:12
```

```
  VPN Routing/Forwarding table "vrf-service"
```

```
  First-hop interface is TenGigabitEthernet1/0/5.3903
```

```
  Tracked by:
```

```
    Static IP Routing 0
```

트랙 옵션을 사용하여 VRF "녹색"에서 기본 경로를 구성합니다

```
!
ip route vrf green 0.0.0.0 0.0.0.0 TenGigabitEthernet1/0/5.3903 192.168.3.2 track 1
!
```

<#root>

Border#



```
show ip route vrf green 0.0.0.0
```

```
Routing Table: green
Routing entry for 0.0.0.0/0, supernet
  Known via "static", distance 1, metric 0, candidate default path
  Redistributing via bgp 65001
  Advertised by bgp 65001
  Routing Descriptor Blocks:
  * 192.168.3.2, via TenGigabitEthernet1/0/5.3903
    Route metric is 0, traffic share count is 1
```

VRF "녹색"에 대한 BGP 프로세스에서 기본 경로 알림이 구성됩니다.

```
<#root>
```

```
router bgp 65001
!
<...snip...>
!
address-family ipv4 vrf green
  advertise l2vpn evpn
  redistribute static
  redistribute connected

  default-information originate

exit-address-family
!
<...snip...>
```

기본 경로가 L2VPN EVPN AF(예: route-type 5)에 알려지고 패브릭을 통해 전파되는지 확인합니다.

```
<#root>
```

```
Border#
```

```
show bgp l2vpn evpn rd 1:1 route-type 5 0 0.0.0.0 0
```

```
BGP routing table entry for [5][1:1][0][0][0.0.0.0]/17, version 622
```

```
Paths: (1 available, best #1, table EVPN-BGP-Table)
```

```
  Advertised to update-groups:
```

```
    2
```

```
  Refresh Epoch 1
```

```
  Local, imported path from base
```

```
    192.168.3.2 (via vrf red) from 0.0.0.0 (172.16.255.6)
```

```
      Origin incomplete, metric 0, localpref 100, weight 32768, valid, external, best
```

```
      EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, local vtep: 172.16.254.6, VNI Label 5090
```

```
      Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD67.EF48
```

```
      rx pathid: 0, tx pathid: 0x0
```

```
      Updated on Jul 8 2022 10:41:40 UTC
```

Leaf-01에서 EVPN, 라우팅, cef 정보 확인

<#root>

Leaf-01#

```
show bgp l2vpn evpn rd 1:1 route-type 5 0 0.0.0.0 0
```

BGP routing table entry for [5][1:1][0][0][0.0.0.0]/17, version 595

Paths: (2 available, best #2, table EVPN-BGP-Table)

Not advertised to any peer

Refresh Epoch 7

Local

172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)

Origin incomplete, metric 0, localpref 100, valid, internal

EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0

Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD67.EF48

Originator: 172.16.255.6, Cluster list: 172.16.255.2

rx pathid: 0, tx pathid: 0

Updated on Jul 8 2022 10:41:40 UTC

Refresh Epoch 7

Local

172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)

Origin incomplete, metric 0, localpref 100, valid, internal, best

EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0

Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD67.EF48

Originator: 172.16.255.6, Cluster list: 172.16.255.1

rx pathid: 0, tx pathid: 0x0

Updated on Jul 8 2022 10:41:40 UTC

Leaf-01#

```
show ip route vrf green 0.0.0.0
```

Routing Table: green

Routing entry for 0.0.0.0/0, supernet

Known via "bgp 65001", distance 200, metric 0, candidate default path, type internal

Last update from 172.16.254.6 on Vlan901, 02:07:17 ago

Routing Descriptor Blocks:

\* 172.16.254.6 (default), from 172.16.255.1, 02:07:17 ago, via Vlan901

opaque\_ptr 0x7FC3606F4D80

Route metri c is 0, traffic share count is 1

AS Hops 0

MPLS label: none

Leaf-01#

```
show ip cef vrf green 0.0.0.0/0
```

0.0.0.0/0

nexthop 172.16.254.6 Vlan901

패브릭에서 외부 네트워크로의 역방향 경로는 요약 경로와 같은 BGP에서 비롯됩니다

<#root>

!

```
ip route vrf vrf-service 10.0.0.0 255.0.0.0 Null0
```

!

```
router bgp 65001
<...snip...>
!
address-family ipv4 vrf vrf-service
  advertise l2vpn evpn

  aggregate-address 10.0.0.0 255.0.0.0 summary-only

  redistribute static
  redistribute connected
  neighbor 192.168.3.2 remote-as 65002
  neighbor 192.168.3.2 activate
exit-address-family
!
<...snip...>
```

VRF "녹색" 및 ping 원격 IP 주소 192.168.255.1의 Leaf-01에서 라우팅 테이블을 확인합니다.

```
<#root>
```

```
Leaf-01#
```

```
show ip route vrf green 192.168.255.1
```

```
Routing Table: green
% Network not in table
```

```
Leaf-01#
```

```
show ip route vrf green 0.0.0.0
```

```
Routing Table: green
Routing entry for 0.0.0.0/0, supernet
  Known via "bgp 65001", distance 200, metric 0, candidate default path, type internal
  Last update from 172.16.254.6 on Vlan901, 05:15:19 ago
  Routing Descriptor Blocks:
  * 172.16.254.6 (default), from 172.16.255.1, 05:15:19 ago, via Vlan901
    opaque_ptr 0x7FC3606F4D80
    Route metric is 0, traffic share count is 1
    AS Hops 0
    MPLS label: none
```

```
Leaf-01#
```

```
show ip cef vrf green 0.0.0.0/0
```

```
0.0.0.0/0
  nexthop 172.16.254.6 Vlan901
```

```
Leaf-01#
```

```
ping vrf green 192.168.3.2 source 10.255.1.11
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.2, timeout is 2 seconds:
Packet sent with a source address of 10.255.1.11
```

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

VRF "vrf-service"의 Border에서 기본 경로가 손실되면 추적 객체가 중단되고 VRF "green"의 고정 경로가 RIB에서 제거되고 BGP에서 광고되는 기본 경로가 제거됩니다

<#root>

### Border ###

Border#

show ip route vrf vrf-service 0.0.0.0

Routing Table: vrf-service  
% Network not in table

Border#

show track 1

Track 1

IP route 0.0.0.0 0.0.0.0 reachability

Reachability is Down (no ip route) <-- Track object is down

3 changes, last change 00:03:15  
VPN Routing/Forwarding table "vrf-service"  
First-hop interface is unknown  
Tracked by:  
Static IP Routing 0

Border#

show ip route vrf green 0.0.0.0

Routing Table: green  
% Network not in table

Border#

show bgp l2vpn evpn rd 1:1 route-type 5 0 0.0.0.0 0

% Network not in table

### Leaf ###

Leaf-01#

show ip route vrf green 0.0.0.0

Routing Table: green  
% Network not in table

VRF "green"에서 VRF "vrf-service"로의 기본 경로를 필터링해야 합니다

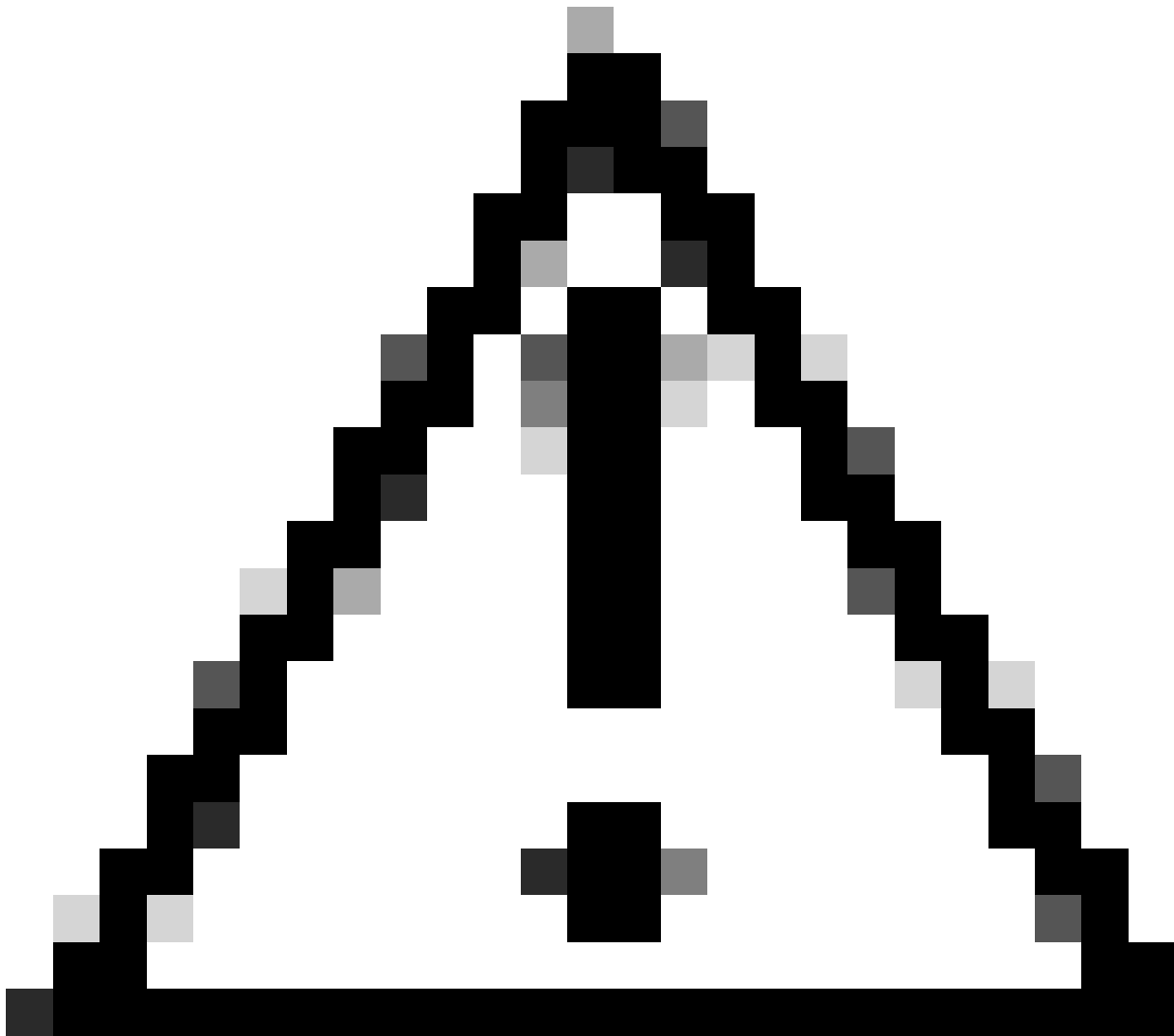
```
<#root>
```

```
vrf definition vrf-service
  rd 3:3
  !
  address-family ipv4

    route-replicate from vrf green unicast all route-map RM-GREEN-2-VRF-SERVICE

    route-target export 3:3
    route-target import 3:3
  exit-address-family

ip prefix-list PL-DEFAULT seq 5 permit 0.0.0.0/0
!
route-map RM-GREEN-2-VRF-SERVICE deny 10
  match ip address prefix-list PL-DEFAULT
!
route-map RM-GREEN-2-VRF-SERVICE permit 20
```

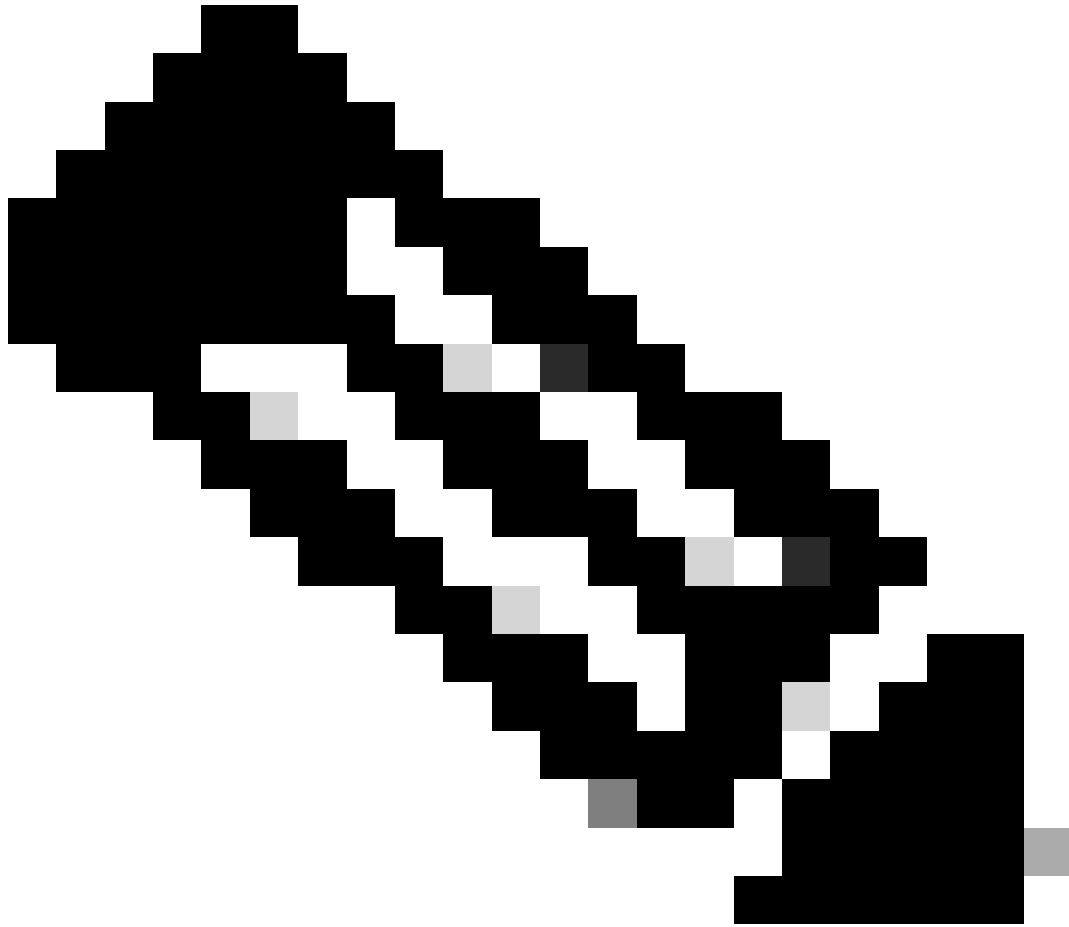


주의: 손실된 기본 경로와 추적 객체 간의 지연 시간이 감소하므로 고정 기본 경로는 VRF "녹색"에서 VRF "vrf-service"로 복제되고 추적 객체를 계속 가동합니다. 따라서 기본 경로가 패브릭에 알려지고 트래픽을 블랙홀합니다.

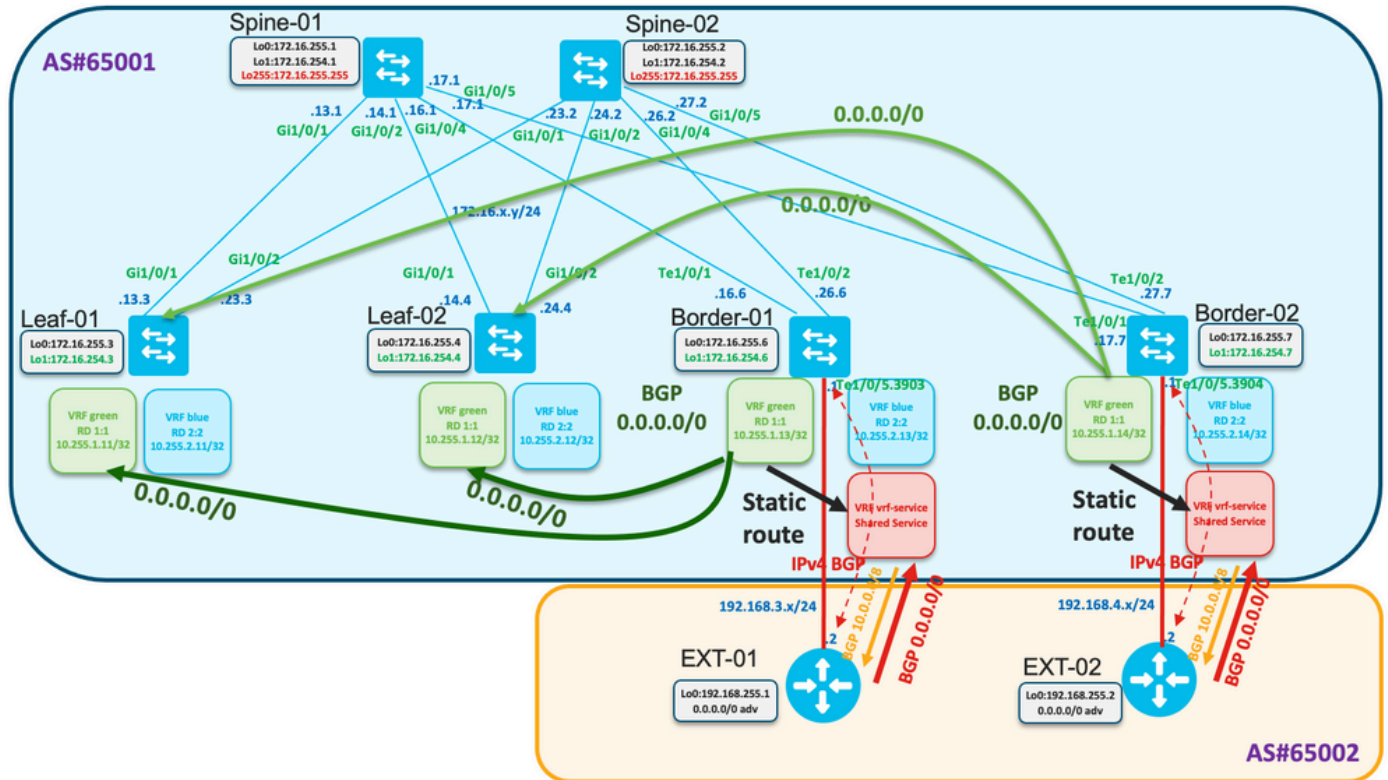
---

## 중복 경계가 있는 기본 경로 알림만

이 섹션에서는 이중 테두리를 사용하는 예시 사례를 제공했습니다.



참고: 이 예에서는 BGP 추가 경로 기능을 사용했습니다. 또 다른 옵션은 Border-01에서 서로 다른 RD를 사용하고 Border-02를 사용하여 양쪽 테두리에서 Leaf로 BOTH 기본 경로를 광고하는 것입니다.



Border-01 및 Border-02 모두 EXT-01 및 EXT-02에서 각각 기본 경로를 수신합니다.

Border-01에서

```
<#root>
```

```
Border-01#
```

```
show ip route vrf vrf-service 0.0.0.0
```

```
Routing Table: vrf-service
Routing entry for 0.0.0.0/0, supernet
  Known via "bgp 65001", distance 20, metric 0, candidate default path
  Tag 65002, type external
  Last update from 192.168.3.2 00:00:06 ago
Routing Descriptor Blocks:
  * 192.168.3.2, from 192.168.3.2, 00:00:06 ago
    opaque_ptr 0x7F68E5AC02A0
    Route metric is 0, traffic share count is 1
    AS Hops 1
    Route tag 65002
    MPLS label: none
```

```
Border-01#
```

```
show ip cef vrf vrf-service 0.0.0.0/0
```

```
0.0.0.0/0
  nexthop 192.168.3.2 TenGigabitEthernet1/0/5.3903
```



## Border-02에서

<#root>

Border-02#

```
show ip route vrf vrf-service 0.0.0.0
```

Routing Table: vrf-service

Routing entry for 0.0.0.0/0, supernet

Known via "bgp 65001", distance 20, metric 0, candidate default path

Tag 65002, type external

Last update from 192.168.4.2 01:22:08 ago

Routing Descriptor Blocks:

\* 192.168.4.2, from 192.168.4.2, 01:22:08 ago

opaque\_ptr 0x7FE529FF3D48

Route metric is 0, traffic share count is 1

AS Hops 1

Route tag 65002

MPLS label: none

Border-02#

```
show ip cef vrf vrf-service 0.0.0.0/0
```

0.0.0.0/0

nexthop 192.168.4.2 TenGigabitEthernet1/0/5.3904

이전 예제와 마찬가지로 듀얼 보더 컨피그레이션에서도 동일한 접근 방식이 사용되었습니다(추적을 사용하는 고정 기본 경로).

Border-01/02 트랙, 기본 고정 경로(vrf "green"), 광고를 위한 bgp 구성을 구성합니다.

<#root>

```
track 1 ip route 0.0.0.0 0.0.0.0 reachability
```

```
ip vrf vrf-service
```

```
!
```

```
ip route vrf green 0.0.0.0 0.0.0.0 TenGigabitEthernet1/0/5.3903 192.168.3.2 track 1
```

```
!
```

```
router bgp 65001
```

```
!
```

```
<...snip...>
```

```
!
```

```
address-family ipv4 vrf green
```

```
advertise l2vpn evpn
```

```
redistribute static
```

```
redistribute connected
```

```
default-information originate
```

```
exit-address-family
```

```
!
```

```
<...snip...>
```

Spine에서 양쪽 테두리의 기본 경로가 수신되는지 확인합니다.

<#root>

Spine-01#

show bgp l2vpn evpn

```
BGP table version is 25, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 1:1					
* ia [5][1:1][0][0][0.0.0.0]/17					
	172.16.254.7	0	100	0	?
*>i	172.16.254.6	0	100	0	?
* i	172.16.254.6	0	100	0	?

<...snip...>

Spine-02#

show bgp l2vpn evpn

```
BGP table version is 75, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 1:1					
* i [5][1:1][0][0][0.0.0.0]/17					
	172.16.254.6	0	100	0	?
* ia	172.16.254.7	0	100	0	?
*>i	172.16.254.6	0	100	0	?

<...snip...>

BOTH 기본 경로 BGP 추가 경로를 전파하도록 Spine에서 구성

<#root>

router bgp 65001

!

<...snip...>

```

!
address-family ipv4 evpn

  bgp additional-paths select all best 2
  bgp additional-paths send receive

<...snip...>

  neighbor 172.16.255.3 advertise additional-paths best 2

<...snip...>

  neighbor 172.16.255.4 advertise additional-paths best 2

!
<...snip...>

```

이 컨피그레이션이 기본 Best-Only 전파를 변경하고 대신 두 경로를 모두 알립니다

```

<#root>
Spine-01#
show bgp ipv4 evpn neighbors 172.16.255.3 advertised-routes

BGP table version is 25, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid,
> best
, i - internal,
      r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
      x best-external,

a additional-path
, c RIB-compressed,
      t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

      Network          Next Hop          Metric LocPrf Weight Path
Route Distinguisher: 1:1

*>i  [5][1:1][0][0][0.0.0.0]/17
                172.16.254.6          0    100    0 ?

<-- best path

* ia [5][1:1][0][0][0.0.0.0]/17
                172.16.254.7          0    100    0 ?

<-- additional path (note the a flag indicating this)

<...snip...>

```

Leaf에서 4개의 BGP 기본 경로를 확인합니다.

<#root>

Leaf-01#

sh bgp l2vpn evpn

BGP table version is 63, local router ID is 172.16.255.3  
Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,  
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,  
x best-external, a additional-path, c RIB-compressed,  
t secondary path, L long-lived-stale,  
Origin codes: i - IGP, e - EGP, ? - incomplete  
RPKI validation codes: V valid, I invalid, N Not found

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 1:1 (default for vrf green)					
* i [5][1:1][0][0][0.0.0.0]/17					
	172.16.254.7	0	100	0	?
* ia	172.16.254.7	0	100	0	?
*>i	172.16.254.6	0	100	0	?
* i	172.16.254.6	0	100	0	?

<...snip...>

Leaf-01#

sh bgp l2vpn evpn route-type 5 0 0.0.0.0 0

BGP routing table entry for [5][1:1][0][0][0.0.0.0]/17, version 64  
Paths: (4 available, best #3, table EVPN-BGP-Table)  
Not advertised to any peer  
Refresh Epoch 4  
Local  
172.16.254.7 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)  
Origin incomplete, metric 0, localpref 100, valid, internal  
EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0  
Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD68.E548  
Originator: 172.16.255.7, Cluster list: 172.16.255.2  
rx pathid: 0x1, tx pathid: 0  
Updated on Aug 24 2022 16:52:56 UTC  
Refresh Epoch 1  
Local  
172.16.254.7 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)  
Origin incomplete, metric 0, localpref 100, valid, internal  
EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0  
Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD68.E548  
Originator: 172.16.255.7, Cluster list: 172.16.255.1  
rx pathid: 0x1, tx pathid: 0  
Updated on Aug 24 2022 16:49:48 UTC  
Refresh Epoch 1  
Local  
172.16.254.6 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)  
Origin incomplete, metric 0, localpref 100, valid, internal, best  
EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0  
Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD67.EF48  
Originator: 172.16.255.6, Cluster list: 172.16.255.1  
rx pathid: 0x0, tx pathid: 0x0  
Updated on Aug 24 2022 16:49:48 UTC

Refresh Epoch 4

Local

```
172.16.254.6 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)
Origin incomplete, metric 0, localpref 100, valid, internal
EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0
Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD67.EF48
Originator: 172.16.255.6, Cluster list: 172.16.255.2
rx pathid: 0x0, tx pathid: 0
Updated on Aug 24 2022 16:52:56 UTC
```

Leaf의 컨피그레이션이 여기에 표시됩니다

<#root>

```
router bgp 65001
!
<...snip...>
!
address-family l2vpn evpn

    bgp additional-paths receive

<...snip...>
!
address-family ipv4 vrf green

    import path selection all
    maximum-paths ibgp 2

<...snip...>
```

리프 라우팅 테이블에서 양쪽 테두리에 대한 두 개의 경로가 표시되는지 확인합니다

<#root>

Leaf-01#

```
show ip route vrf green
```

Routing Table: green

<...snip...>

```
Gateway of last resort is 172.16.254.7 to network 0.0.0.0
```

```
B*    0.0.0.0/0 [200/0] via 172.16.254.7, 00:02:15, Vlan901
      [200/0] via 172.16.254.6, 00:02:15, Vlan901
```

<...snip...>

Leaf-01#

```
show ip cef vrf green 0.0.0.0/0
```

0.0.0.0/0

```
    nexthop 172.16.254.6 Vlan901
```

```
    nexthop 172.16.254.7 Vlan901
```

Border-01에서 기본 경로를 분실한 경우 어떻게 되는지 확인합니다.

```
<#root>
```

```
Border-01#
```

```
show ip route vrf vrf-service 0.0.0.0
```

```
Routing Table: vrf-service  
% Network not in table
```

트랙이 다운됨

```
<#root>
```

```
Border-01#
```

```
show track 1
```

```
Track 1
```

```
IP route 0.0.0.0 0.0.0.0 reachability
```

```
Reachability is Down (no ip route)
```

```
5 changes, last change 00:00:56
```

```
VPN Routing/Forwarding table "vrf-service"
```

```
First-hop interface is unknown
```

```
Tracked by:
```

```
Static IP Routing 0
```

Spines에서는 Border-02에서만 경로가 표시됩니다.

```
<#root>
```

```
Spine-01#
```

```
show bgp l2vpn evpn
```

```
BGP table version is 27, local router ID is 172.16.255.1
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,  
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,  
x best-external, a additional-path, c RIB-compressed,  
t secondary path, L long-lived-stale,
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 1:1					
* i [5][1:1][0][0][0.0.0.0]/17					
	172.16.254.7	0	100	0	?
*>i	172.16.254.7	0	100	0	?

<...snip...>

Leaf에서는 Border-02로부터의 경로만 볼 수 있습니다.

<#root>

Leaf-01#

show bgp l2vpn evpn

```
BGP table version is 68, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
Route Distinguisher: 1:1 (default for vrf green)					
*>i [5][1:1][0][0][0.0.0.0]/17					
	172.16.254.7	0	100	0	?
* i	172.16.254.7	0	100	0	?

<...snip...>

Leaf-01#

sh bgp l2vpn evpn route-type 5 0 0.0.0.0 0

BGP routing table entry for [5][1:1][0][0][0.0.0.0]/17, version 68

Paths: (2 available, best #1, table EVPN-BGP-Table)

Not advertised to any peer

Refresh Epoch 1

Local

172.16.254.7 (metric 3) (via default) from 172.16.255.1 (172.16.255.1)

Origin incomplete, metric 0, localpref 100, valid, internal, best

EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0

Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD68.E548

Originator: 172.16.255.7, Cluster list: 172.16.255.1

rx pathid: 0x0, tx pathid: 0x0

Updated on Aug 24 2022 17:17:31 UTC

Refresh Epoch 4

Local

172.16.254.7 (metric 3) (via default) from 172.16.255.2 (172.16.255.2)

Origin incomplete, metric 0, localpref 100, valid, internal

EVPN ESI: 00000000000000000000, Gateway Address: 0.0.0.0, VNI Label 50901, MPLS VPN Label 0

Extended Community: RT:1:1 ENCAP:8 Router MAC:0C75.BD68.E548

Originator: 172.16.255.7, Cluster list: 172.16.255.2

rx pathid: 0x0, tx pathid: 0

Updated on Aug 24 2022 17:17:31 UTC

라우팅 테이블과 Leaf-01의 CEF에는 하나의 경로만 존재합니다

<#root>

```
Leaf-01#
```

```
show ip route vrf green
```

```
Routing Table: green
```

```
<...snip...>
```

```
Gateway of last resort is 172.16.254.7 to network 0.0.0.0
```

```
B* 0.0.0.0/0 [200/0] via 172.16.254.7, 00:04:02, Vlan901
```

```
<...snip...>
```

```
Leaf-01#
```

```
show ip cef vrf green 0.0.0.0/0
```

```
0.0.0.0/0
```

```
nexthop 172.16.254.7 Vlan901
```

## 관련 정보

- [기술 지원 및 문서 - Cisco Systems](#)
- [BGP EVPN VXLAN 컨피그레이션 가이드, Cisco IOS XE Amsterdam 17.3.x\(Catalyst 9500 스위치\)](#)
- [BGP EVPN VXLAN에 대한 기능 기록](#)



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