在IOS XE上配置VRF泄漏

目录

简介

本文档介绍并提供虚拟路由和转发(VRF)路由泄漏的常用方法的配置示例。

先决条件

要求

Cisco 建议您了解以下主题：

- 边界网关协议 (BGP)
- 路由协议再分配
- VRF
- Cisco IOS® XE软件

有关这些主题的详细信息，请参阅：

重分布路由协议

在 EIGRP 与 BGP 之间相互再分配的配置示例

了解OSPF路由重分发到BGP

使用的组件

本文档中的信息基于使用Cisco IOS® XE版本16.12.X和17.X的路由器

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

VRF允许路由器为不同的虚拟网络维护单独的路由表。需要例外时，VRF路由泄漏允许在VRF之间路由某些流量，而不使用静态路由。

场景1 - BGP和IGP之间的VRF路由泄漏(EIGRP)

场景1提供了BGP和EIGRP之间的VRF路由泄漏示例。此方法可用于其他IGP。

网络图

如图1所示的网络图显示了需要路由泄漏的第3层拓扑。

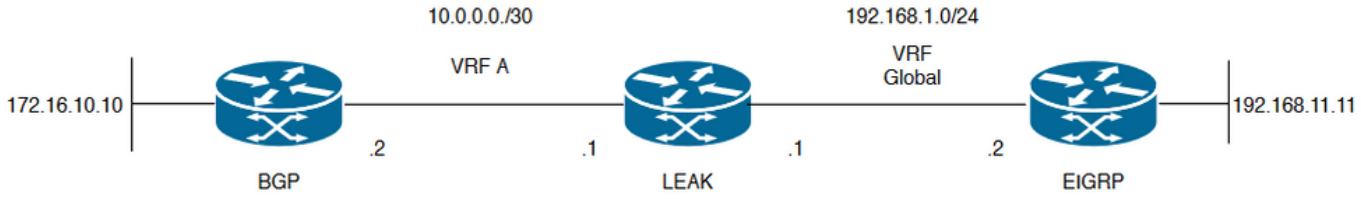

图1.场景1的路由泄漏拓扑

路由器“LEAK”具有到VRF A中邻居的BGP邻居关系，以及全局VRF中的EIGRP邻居。 设备192.168.11.11必须能够通过网络连接到设备172.16.10.10。

路由器LEAK无法在两者之间进行路由，因为路由处于不同的VRF中。 这些路由表显示每个VRF的当前路由，并指明哪些路由需要在全局VRF和VRF A之间泄漏。

泄漏路由表：

EIGRP路由表（全局路由）

```
LEAK#show ip route
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

Gateway of last resort is not set

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, GigabitEthernet2
L 192.168.1.1/32 is directly connected, GigabitEthernet2
192.168.11.0/32 is subnetted, 1 subnets
D 192.168.11.11 [90/130816] via 192.168.1.2, 02:30:29, GigabitEthernet2 >> Route to be exchange
to the VRF A routing table.
```

VRF A路由表

```
LEAK#show ip route vrf A

Routing Table: A
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

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/30 is directly connected, GigabitEthernet1
L 10.0.0.1/32 is directly connected, GigabitEthernet1
172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [200/0] via 10.0.0.2, 01:47:58 >> Route to be exchange to the global routing
table.
```

配置

请按照以下步骤在两个路由表之间创建泄漏：

Step 1.
Create route-maps to filter the routes to be injected in both routing tables.

```
LEAK(config)#Route-map VRF_TO_EIGRP
LEAK(config-route-map)#match ip address prefix-list VRF_TO_EIGRP
LEAK(config-route-map)#exit
!
Prefix-list created to match the host that is attached to the previous route-map configured.
!
ip prefix-list VRF_TO_EIGRP permit 172.16.10.10/32

or
```

```
LEAK(config)#Route-map VRF_TO_EIGRP
LEAK(config-route-map)# match ip address 10
LEAK(config-route-map)#exit
!
ACL created to match the host that is attached to the previous route-map.
!
LEAK#show ip access-lists 10
10 permit 172.16.10.10

LEAK(config)#Route-map EIGRP_TO_VRF
LEAK(config-route-map)#match ip address prefix-list EIGRP_TO_VRF
LEAK(config-route-map)#exit
LEAK(config)#
!
Prefix-list created to match the host that is attached to the previous route-map configured.
!
ip  prefix-list EIGRP_TO_VRF  permit 192.168.11.11/32

or

LEAK(config)#Route-map EIGRP_TO_VRF
LEAK(config-route-map)#match ip address 20
LEAK(config-route-map)#exit
LEAK(config)#
!
ACL created to match the host that is attached to the previous route-map.
!
LEAK#show ip access-list 20
10 permit 192.168.11.11


Step 2.
Define the import/export maps and add the route-map names.

LEAK(config)#vrf definition A
LEAK(config-vrf)#address-family ipv4
LEAK(config-vrf-af)#import ipv4 unicast map EIGRP_TO_VRF >> Import the global routing table
routes at the VRF routing table.
LEAK(config-vrf-af)#export ipv4 unicast map VRF_TO_EIGRP >> Export the VRF routes to the Global
Routing Table.
LEAK(config-vrf-af)#end

Step 3.
Proceed with the dual redistribution.

Redistribute EIGRP

LEAK(config)#router bgp 1
LEAK(config-router)#redistribute eigrp 1
LEAK(config-router)#end

Redistribution BGP

LEAK(config)#router eigrp 1
LEAK(config-router)#redistribute bgp 1 metric 100 1 255 1 1500
LEAK(config-router)#end
```

验证

Routing table from VRF A

```
LEAK#show ip route vrf A

Routing Table: A

< Snip for resume >

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/30 is directly connected, GigabitEthernet1
L 10.0.0.1/32 is directly connected, GigabitEthernet1
172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [200/0] via 10.0.0.2, 00:58:53
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
B 192.168.1.0/24 is directly connected, 00:01:00, GigabitEthernet2
L 192.168.1.1/32 is directly connected, GigabitEthernet2
192.168.11.0/32 is subnetted, 1 subnets
B 192.168.11.11 [20/130816] via 192.168.1.2, 00:01:00, GigabitEthernet2 >> Route from global
routing table at VRF A routing table.

Global Routing Table (EIGRP)

LEAK#show ip route

< snip for resume >

Gateway of last resort is not set

172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [200/0] via 10.0.0.2 (A), 00:04:47  >> Route from VRF A at global routing table.
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, GigabitEthernet2
L 192.168.1.1/32 is directly connected, GigabitEthernet2
192.168.11.0/32 is subnetted, 1 subnets
D 192.168.11.11 [90/130816] via 192.168.1.2, 01:03:35, GigabitEthernet2
LEAK#
```

场景2 - VRF A和VRF B之间的VRF泄漏

场景2描述了两个不同VRF之间的泄漏。

网络图

本文档使用以下网络设置：

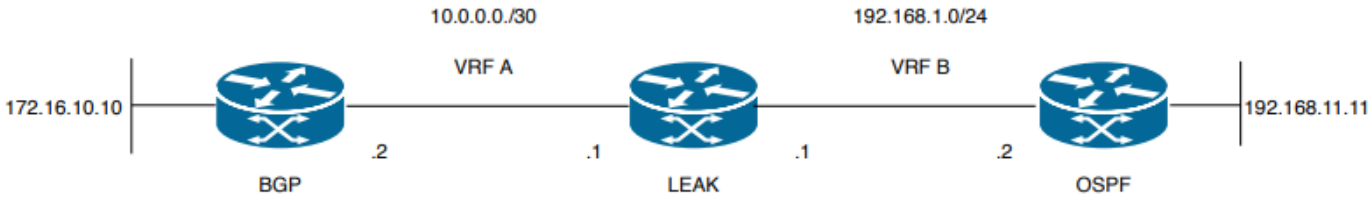

图2.场景2的路由泄漏拓扑

路由器“LEAK”与VRF A中的邻居具有BGP邻居关系，VRF B中具有OSPF邻居关系。设备192.168.11.11需要通过网络连接到设备172.16.10.10。

路由器LEAK无法在两者之间进行路由，因为路由处于不同的VRF中。这些路由表显示每个VRF的当前路由，并指明需要在VRF A和VRF B之间泄漏哪些路由。

泄漏路由表：

VRF A路由表

```
LEAK#show ip route vrf A

Routing Table: A
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

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/30 is directly connected, Ethernet0/0
L 10.0.0.2/32 is directly connected, Ethernet0/0
172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [200/0] via 10.0.0.1, 00:03:08 >> Route to be exchange to routing table VRF B.
```

VRF B路由表

```
LEAK#show ip route vrf B

Routing Table: B
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

Gateway of last resort is not set

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, Ethernet0/1
L 192.168.1.2/32 is directly connected, Ethernet0/1
192.168.11.0/32 is subnetted, 1 subnets
O 192.168.11.11 [110/11] via 192.168.1.1, 00:58:45, Ethernet0/1 >> Route to be exchange to
routing table VRF A.
```

配置

执行以下步骤创建两个路由表之间的泄漏：

Step 1.
Create route-maps to filter the routes to be injected in both routing tables.

```
LEAK(config)#Route-map VRFA_TO_VRFB
LEAK(config-route-map)#match ip address prefix-list VRFA_TO_VRFB
LEAK(config-route-map)#exit
!
Prefix-list created to match the host and IP segment that is attached to the previous route-map
configured.
!
ip prefix-list VRFA_TO_VRFB permit 172.16.10.10/32
ip prefix-list VRFA_TO_VRFB permit 10.0.0.0/30
```

or

```
LEAK(config)#Route-map VRFA_TO_VRFB
LEAK(config-route-map)#match ip address 10
LEAK(config-route-map)#exit
!
ACL created to match the host and IP segment that is attached to the previous route-map.
!
LEAK#show ip access-lists 10
10 permit 172.16.10.10
20 permit 10.0.0.0
```

```
LEAK(config)#Route-map VRFB_TO_VRFA
LEAK(config-route-map)#match ip address prefix-list VRFB_TO_VRFA
LEAK(config-route-map)#exit
!
Prefix-list created to match the host and IP segment that is attached to the previous route-map
configured.
!
ip prefix-list VRFB_TO_VRFA permit 192.168.11.11/32
ip prefix-list VRFB_TO_VRFA permit 192.168.1.0/24
```

or

```
LEAK(config)#Route-map VRFB_TO_VRFA
LEAK(config-route-map)#match ip address 20
LEAK(config-route-map)#exit
!
ACL created to match the host and IP segment that is attached to the previous route-map
configured.
!
LEAK#show ip access-lists 20
10 permit 192.168.11.11
20 permit 192.168.1.0
```

Step 2.
At the VRFs configure the import/export map, use the route-map names to leak the routes.

```
LEAK(config)#vrf definition A
LEAK(config-vrf)#address-family ipv4
LEAK(config-vrf-af)#export map VRFA_TO_VRFB
LEAK(config-vrf-af)#import map VRFB_TO_VRFA
```

```
LEAK(config)#vrf definition B
LEAK(config-vrf)#address-family ipv4
LEAK(config-vrf-af)#export map VRFB_TO_VRFA
LEAK(config-vrf-af)#import map VRFA_TO_VRFB
```

Step 3.
Add the route-target to import and export the route distinguiser from both VRFs.

```
! --- Current configuration for VRF A

vrf definition A
rd 1:2
!
address-family ipv4
route-target export 1:2
route-target import 1:1
exit-address-family

! --- Current configuration from VRF B

vrf definition B
rd 2:2
!
address-family ipv4
exit-address-family

! --- Import the routes from VRF B into VRF A

LEAK(config)#vrf definition A
LEAK(config-vrf)#address-family ipv4
LEAK(config-vrf-af)#route-target import 2:2

! --- Import routes from VRF A to VRF B and export routes from VRF B

LEAK(config-vrf-af)#vrf definition B
LEAK(config-vrf)#address-family ipv4
LEAK(config-vrf-af)#route-target import 1:2
LEAK(config-vrf-af)#route-target export 2:2
```

验证

Check the Routing Tables

VRF A Routing Table

```
LEAK#show ip route vrf A

Routing Table: A

<Snip for resume >

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/30 is directly connected, Ethernet0/0
L 10.0.0.2/32 is directly connected, Ethernet0/0
172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [200/0] via 10.0.0.1, 00:07:20
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
B 192.168.1.0/24 is directly connected, 00:00:10, Ethernet0/1
L 192.168.1.2/32 is directly connected, Ethernet0/1
192.168.11.0/32 is subnetted, 1 subnets
B 192.168.11.11 [20/11] via 192.168.1.1 (B), 00:00:10, Ethernet0/1 >> Route from VRF B routing
table at VRF A.
```

VRF B Routing Table

```
LEAK#show ip route vrf B
Routing Table: B

< Snip for resume >

10.0.0.0/30 is subnetted, 1 subnets
B 10.0.0.0 [200/0] via 10.0.0.1 (A), 00:00:15
172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [200/0] via 10.0.0.1 (A), 00:00:15 >> Route from VRF A routing table at VRF B.
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, Ethernet0/1
L 192.168.1.2/32 is directly connected, Ethernet0/1
192.168.11.0/32 is subnetted, 1 subnets
O 192.168.11.11 [110/11] via 192.168.1.1, 01:05:12, Ethernet0/1
```

场景3 — 使用BGP的OSPF(VRF)和EIGRP（全局）之间的VRF泄漏（可选）

场景3描述了两个IGP（VRF B和全局VRF）之间的路由泄漏。

网络图

本文档使用以下网络设置：

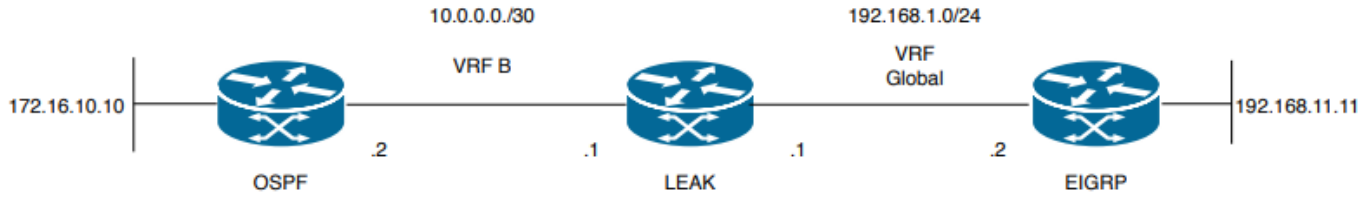

图3.场景3的路由泄漏拓扑

路由器“LEAK”与VRF B中的邻居具有OSPF邻居关系，而全局VRF中具有EIGRP邻居关系。设备172.16.10.10需要能够通过网络连接到设备192.168.11.11。

路由器LEAK无法连接这两台主机。这些路由表显示每个VRF的当前路由，并指明需要在VRF B和全局VRF之间泄漏哪些路由。

> **注**：此配置作为执行泄漏的示例展示，当其中一个IGP位于VRF上时，使用在VRF和全局之间重新分配
> 设备不允许VRF。

泄漏路由表：

EIGRP路由表(EIGRP)

```
LEAK#show ip route
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

Gateway of last resort is not set

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, Ethernet0/1
L 192.168.1.1/32 is directly connected, Ethernet0/1
192.168.11.0/32 is subnetted, 1 subnets
D 192.168.11.11 [90/1024640] via 192.168.1.2, 01:08:38, Ethernet0/1 >> Route to be exchange from
global routing table at VRF B routing table.
```

VRF B路由表(OSPF)

```
LEAK#show ip route vrf B

Routing Table: B
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

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/30 is directly connected, Ethernet0/0
L 10.0.0.2/32 is directly connected, Ethernet0/0
172.16.0.0/32 is subnetted, 1 subnets
O 172.16.10.10 [110/11] via 10.0.0.1, 01:43:45, Ethernet0/0 >> Route to be exchange from routing
table VRF B at global routing table.
```

配置

执行以下步骤创建两个路由表之间的泄漏：

Step 1.
Create route-maps for import and export to be injected in both routing tables.

```
LEAK(config)#Route-map OSPF_TO_EIGRP
LEAK(config-route-map)#match ip address prefix-list OSPF_TO_EIGRP
LEAK(config-route-map)#exit
!
```

```
Prefix-list created to match the host that is attached to the previous route-map configured.
!
ip prefix-list OSPF_TO_EIGRP permit 172.16.10.10/32
ip prefix-list OSPF_TO_EIGRP permit 10.0.0.0/30

or

LEAK(config)#Route-map OSPF_TO_EIGRP
LEAK(config-route-map)#match ip address 10
LEAK(config-route-map)#exit
!
ACL created to match the host that is attached to the previous route-map.
!
LEAK#show ip access-lists 10
10 permit 172.16.10.10
20 permit 10.0.0.0

LEAK(config)#Route-map EIGRP_TO_OSPF
LEAK(config-route-map)#match ip address prefix-list EIGRP_TO_OSPF
LEAK(config-route-map)#exit
!
Prefix-list created to match the host that is attached to the previous route-map configured.
!
ip prefix-list EIGRP_TO_OSPF permit 192.168.11.11/32
ip prefix-list EIGRP_TO_OSPF permit 192.168.1.0/24

or

LEAK(config)#Route-map EIGRP_TO_OSPF
LEAK(config-route-map)#match ip address 20
LEAK(config-route-map)#exit
!
ACL created to match the host that is attached to the previous route-map.
!
LEAK#show ip access-lists 20
10 permit 192.168.11.11
20 permit 192.168.1.0/24
```

Step 2.
Add the import/export maps in order to match the route-map names.

```
Current configuration
!
vrf definition B
rd 1:2
!
address-family ipv4
exit-address-family
!
!
LEAK(config-vrf)#vrf definition B
LEAK(config-vrf)#address-family ipv4
LEAK(config-vrf-af)#import ipv4 unicast map EIGRP_TO_OSPF
LEAK(config-vrf-af)#export ipv4 unicast map OSPF_TO_EIGRP
```

Step 3.
To perform the leak is necessary to create a BGP process, in order to redistribute
the IGPs protocols.

```
router bgp 1
bgp log-neighbor-changes
!
address-family ipv4 vrf B >> Include the address-family to inject VRF B routing table (OSPF)
!
```

```
exit-address-family
```

注：确保VRF配置了路由标识符以避免错误：
"%vrf B does not have "rd" configured, please configure "rd" before configuring import route-map"

Step 4.
Create a Dual Redistribution.

IGPs redistribution.

```
LEAK(config-router)#router bgp 1
LEAK(config-router)#redistribute eigrp 1
!
LEAK(config-router)#address-family ipv4 vrf B
LEAK(config-router-af)#redistribute ospf 1 match internal external 1 external 2
LEAK(config-router-af)#end
```

BGP Redistribution

```
LEAK(config)#router ospf 1 vrf B
LEAK(config-router)#redistribute bgp 1
!
LEAK(config-router)#router eigrp TAC
LEAK(config-router)#
LEAK(config-router)# address-family ipv4 unicast autonomous-system 1
LEAK(config-router-af)#
LEAK(config-router-af)# topology base
LEAK(config-router-af-topology)#redistribute bgp 1 metric 100 1 255 1 1500
```

验证

检查路由表

全局路由表

```
LEAK#show ip route

<Snip for resume >

172.16.0.0/32 is subnetted, 1 subnets
B 172.16.10.10 [20/11] via 10.0.0.1, 00:14:48, Ethernet0/0 >> Route from VRF B routing table at global routing table ( EIGRP ).
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, Ethernet0/1
L 192.168.1.1/32 is directly connected, Ethernet0/1
192.168.11.0/32 is subnetted, 1 subnets
D 192.168.11.11 [90/1024640] via 192.168.1.2, 02:16:51, Ethernet0/1
```

VRF B路由表

```
LEAK#show ip route vrf B
Routing Table: B

<Snip for resume >

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/30 is directly connected, Ethernet0/0
L 10.0.0.2/32 is directly connected, Ethernet0/0
172.16.0.0/32 is subnetted, 1 subnets
O 172.16.10.10 [110/11] via 10.0.0.1, 00:34:25, Ethernet0/0
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
```

```
B 192.168.1.0/24 is directly connected, 00:08:51, Ethernet0/1
L 192.168.1.1/32 is directly connected, Ethernet0/1
192.168.11.0/32 is subnetted, 1 subnets
B 192.168.11.11 [20/1024640] via 192.168.1.2, 00:08:51, Ethernet0/1 >> Route from global routing table ( EIGRP ) at VRF B routing table.
```

其它资源

关于此翻译
思科采用人工翻译与机器翻译相结合的方式将此文档翻译成不同语言，希望全球的用户都能通过各自的语言得到支持性的内容。

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