

有VRF的GRE隧道的配置示例

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简介

本文档提供了在通用路由封装 (GRE) 隧道接口下的 VPN 路由和转发 (VRF) 实例的配置示例。

先决条件

要求

尝试进行此配置之前，请确保满足以下要求：

本文档的读者应掌握以下这些主题的相关知识：

- [配置多协议标签交换](#)
- [MPLS 虚拟专用网](#)
- [通用路由封装隧道 IP 源及目标 VRF 成员](#)

使用的组件

本文档中的信息基于 3725 系列路由器上运行的 Cisco IOS® 软件版本 12.3(4)T1。

使用 [Cisco Feature Navigator II \(仅限于注册用户\)](#)，然后搜索 **GRE 隧道 IP 源及目标 VRF 成员** 功能，以了解您需要的其他软件和硬件要求。

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。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文件规则的更多信息请参见“Cisco技术提示规则”。

配置

本部分提供有关如何配置本文档所述功能的信息。

该配置的设置方法如下：

- R1-CE 和 R2-CE 位于 VRF BLUE。
- R1-CE 也位于绿色VRF中，通过使用GRE隧道到达R3-PE。

R1-CE 采用静态主机路由到达 R3-PE（隧道目标位置），可确保 GRE 隧道不会出现递归路由（通过隧道获知隧道目标地址）。

VRF BLUE 和 VRF GREEN 由两家不同的公司拥有，各自之间不会发生路由泄露。此外，R1-CE 和 R2-CE 之间接口上的访问控制列表 (ACL) 只能用于允许这两者之间的 GRE 数据流。

注：要查找有关本文档中使用的命令的其他信息，请使用命令[查找工具](#)(仅注册客户)。

网络图

本文档使用以下网络设置：

图 1 – 物理拓扑

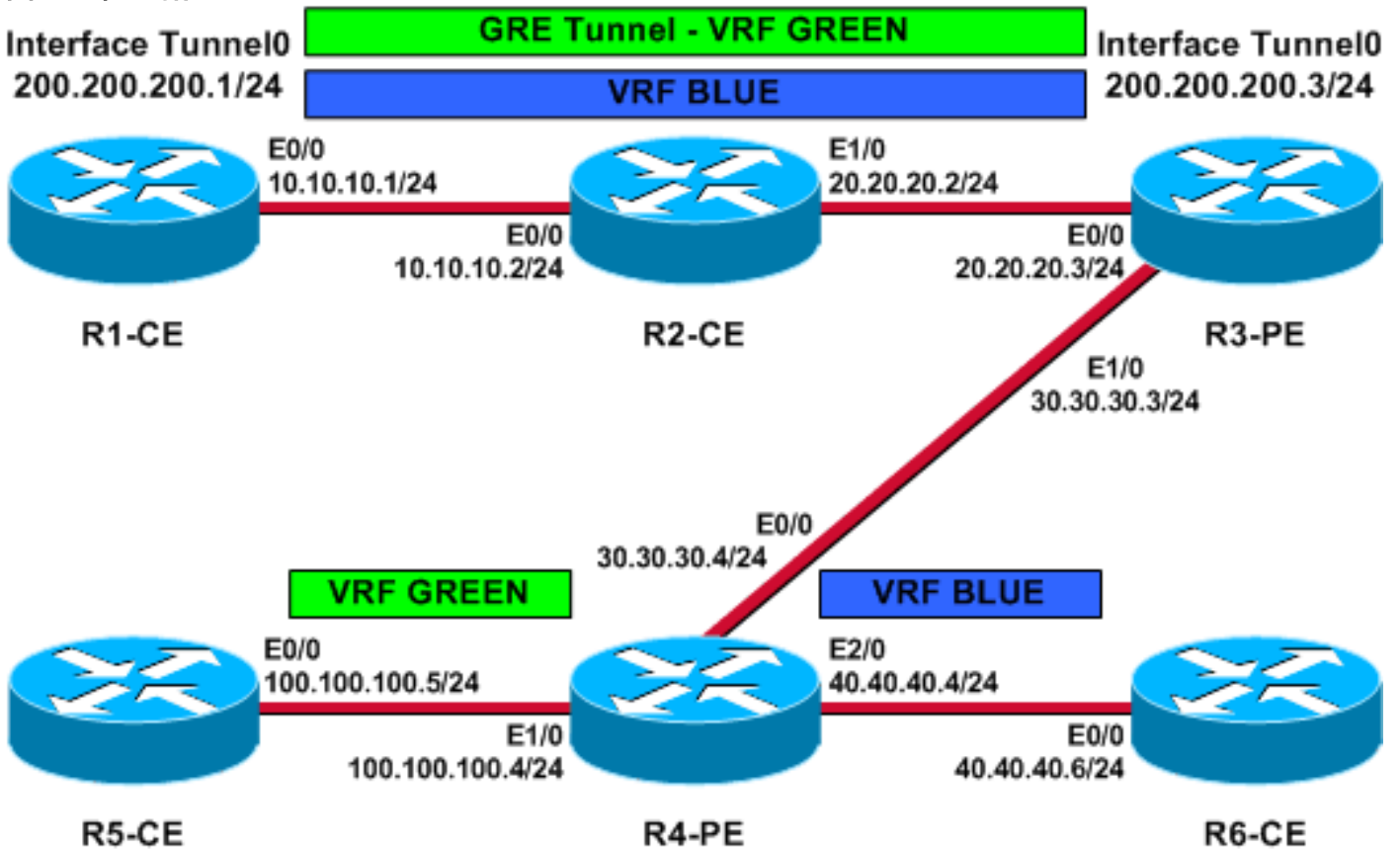
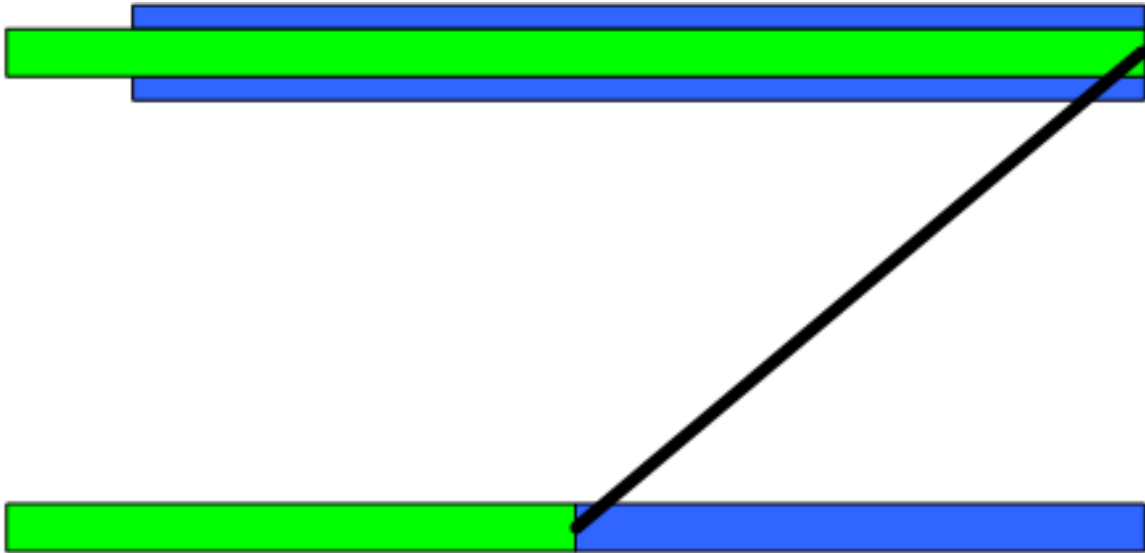


图 2 – 逻辑 VRF 拓扑



配置

本文档使用以下配置：

- [R3-PE](#)
- [R4-PE](#)
- [R1-CE](#)
- [R2-CE](#)
- [R5-CE](#)
- [R6-CE](#)

R3-PE (隧道终点)

```
R3-PE# show running-config

Building configuration...

.
!
no ip domain lookup
!
ip vrf blue
  rd 1:1
  route-target export 311:311
  route-target import 411:411
!
ip vrf green
  rd 2:2
  route-target export 322:322
  route-target import 422:422
!
ip cef
!
interface Tunnel0
  ip vrf forwarding green
  ip address 200.200.200.3 255.255.255.0
  tunnel source Ethernet0/0
  tunnel destination 10.10.10.1
  tunnel vrf blue
!--- Tunnel 0 is part of VRF GREEN; but it uses the
!--- destination and source addresses from the
!--- routing !--- table of VRF BLUE, because of this tunnel
```

```
vrf blue !--- command.

!
interface Ethernet0/0
 ip vrf forwarding blue
 ip address 20.20.20.3 255.255.255.0
 !--- Connection to the VRF BLUE network and the VRF GREEN !--- network using the GRE tunnel. ! interface
 Ethernet1/0 ip address 30.30.30.3 255.255.255.0 tag-
 switching ip ! router bgp 1 no bgp default ipv4-unicast
 bgp log-neighbor-changes neighbor 30.30.30.4 remote-as 1
 ! address-family vpnv4 neighbor 30.30.30.4 activate
 neighbor 30.30.30.4 send-community extended exit-
 address-family ! address-family ipv4 vrf green
 redistribute connected no auto-summary no
 synchronization exit-address-family ! address-family
 ipv4 vrf blue redistribute connected no auto-summary no
 synchronization exit-address-family ! ip classless ip
 route vrf blue 10.10.10.1 255.255.255.255 20.20.20.2 !--
 - Static Host route to ensure that recursive routing !--
 - does not occur. no ip http server ! . end
```

R4-PE

```
R4-PE# show running-config

Building configuration...
.
.
.
no ip domain lookup
!
ip vrf blue
 rd 1:1
 route-target export 411:411
 route-target import 311:311
!
ip vrf green
 rd 2:2
 route-target export 422:422
 route-target import 322:322
!
ip cef
!
interface Ethernet0/0
 ip address 30.30.30.4 255.255.255.0
 tag-switching ip
!
interface Ethernet1/0
 ip vrf forwarding green
 ip address 100.100.100.4 255.255.255.0
!
interface Ethernet2/0
 ip vrf forwarding blue
 ip address 40.40.40.4 255.255.255.0
!
router bgp 1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 neighbor 30.30.30.3 remote-as 1
!
 address-family vpnv4
 neighbor 30.30.30.3 activate
```

```
neighbor 30.30.30.3 send-community extended
exit-address-family
!
address-family ipv4 vrf green
redistribute connected
no auto-summary
no synchronization
exit-address-family
!
address-family ipv4 vrf blue
redistribute connected
no auto-summary
no synchronization
exit-address-family
!
ip classless
.
.
end
```

R1-CE (隧道终点)

```
R1-CE# show running-config
Building configuration...
.
.
no ip domain lookup

!
ip cef
!
interface Tunnel0
 ip address 200.200.200.1 255.255.255.0
 tunnel source Ethernet0/0
 tunnel destination 20.20.20.3
!--- Both the tunnel source and destination address are
in !--- the VRF BLUE, to provide transport for the VRF
GREEN !--- network. ! interface Ethernet0/0 description
Connection to R2-CE router ip address 10.10.10.1
255.255.255.0 ip access-group 100 in ip access-group 100
out !--- Access-group to allow only GRE packets through
the !--- R2-CE network. However, R1-CE networks data is
in the !--- GRE packet. ! ! ip classless ip route
0.0.0.0 0.0.0.0 Tunnel0 ip route 20.20.20.3
255.255.255.255 10.10.10.2 !--- Static Host route to
ensure that recursive routing !--- does not occur. no ip
http server ! access-list 100 permit gre host 10.10.10.1
host 20.20.20.3 access-list 100 permit gre host
20.20.20.3 host 10.10.10.1 !--- Permits only GRE packets
between the endpoints. ! . . end
```

R2-CE

```
R2-CE# show running-config
Building configuration...
.
.
no ip domain lookup

!
ip cef
!
```

```
interface Ethernet0/0
  description Connection to R1-CE router
  ip address 10.10.10.2 255.255.255.0
  ip access-group 100 in
  ip access-group 100 out
!
interface Ethernet1/0
  ip address 20.20.20.2 255.255.255.0
!
ip classless
ip route 0.0.0.0 0.0.0.0 20.20.20.3
no ip http server
!
access-list 100 permit gre host 10.10.10.1 host
20.20.20.3
access-list 100 permit gre host 20.20.20.3 host
10.10.10.1
!--- Permits only GRE packets between the endpoints. . !
end
```

R5-CE

```
R5-CE# show running-config

Building configuration...

.
.
no ip domain lookup

!
interface Ethernet0/0
  ip address 100.100.100.5 255.255.255.0
!
!
ip classless
ip route 0.0.0.0 0.0.0.0 100.100.100.4
no ip http server
!
.
end
```

R6-CE

```
R6-CE# show running-config

Building configuration...

.
.
no ip domain lookup

!
interface Ethernet0/0
  ip address 40.40.40.6 255.255.255.0
!
!
ip classless
ip route 0.0.0.0 0.0.0.0 40.40.40.4
no ip http server
!
.
end
```

验证

本部分所提供的信息可用于确认您的配置是否正常工作。

[命令输出解释程序工具 \(仅限注册用户 \) 支持某些 show 命令](#)，使用此工具可以查看对 show 命令输出的分析。

- [show ip route](#)、show ip route vrf - 在隧道终点发出这些命令能够确保可到达隧道目标位置。这将确保隧道接口会出现。
- [ping](#) - 从 CE 的另一端发出此命令能够确保从 CE 可以到达隧道。
- [show ip bgp vpnv4 all labels](#) — 在PE设备上发出此命令，以查看通过边界网关协议(BGP)分配给其他PE设备的每个前缀的VPN标签。

```
R3-PE# show ip route vrf blue 10.10.10.1
```

```
Routing entry for 10.10.10.1/32
Known via "static", distance 1, metric 0
Routing Descriptor Blocks:
* 20.20.20.2
Route metric is 0, traffic share count is 1
```

```
R3-PE# show ip route vrf green
```

```
Routing Table: green
Codes: 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
       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
       o - ODR, P - periodic downloaded static route
```

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

```
C    200.200.200.0/24 is directly connected, Tunnel0
     100.0.0.0/24 is subnetted, 1 subnets
B    100.100.100.0 [200/0] via 30.30.30.4, 01:11:45
```

```
R3-PE# show interfaces tunnel 0
```

```
Tunnel0 is up, line protocol is up
Hardware is Tunnel
Internet address is 200.200.200.3/24
MTU 1514 bytes, BW 9 Kbit, DLY 500000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation TUNNEL, loopback not set
Keepalive not set
Tunnel source 20.20.20.3 (Ethernet0/0), destination 10.10.10.1
Tunnel protocol/transport GRE/IP, key disabled, sequencing disabled
Tunnel TTL 255
Checksumming of packets disabled, fast tunneling enabled
Last input 00:44:05, output 00:26:16, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/0 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
```

105 packets input, 11964 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
83 packets output, 10292 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets
0 output buffer failures, 0 output buffers swapped out

R3-PE# **show ip bgp vpnv4 all labels**

Network	Next Hop	In label/Out label
Route Distinguisher: 1:1 (blue)		
20.20.20.0/24	0.0.0.0	16/aggregate(blue)
Route Distinguisher: 2:2 (green)		
100.100.100.0/24	30.30.30.4	nolabel/16
200.200.200.0	0.0.0.0	17/aggregate(green)

R4-PE# **show ip route vrf blue**

Routing Table: blue

Codes: 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
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
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

20.0.0.0/24 is subnetted, 1 subnets
B 20.20.20.0 [200/0] via 30.30.30.3, 01:14:05

R4-PE# **show ip route vrf green**

Routing Table: green

Codes: 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
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
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

B 200.200.200.0/24 [200/0] via 30.30.30.3, 01:14:10
100.0.0.0/24 is subnetted, 1 subnets
C 100.100.100.0 is directly connected, Ethernet1/0

R1-CE# **show ip route 20.20.20.3**

Routing entry for 20.20.20.3/32
Known via "static", distance 1, metric 0
Routing Descriptor Blocks:
* 10.10.10.2
Route metric is 0, traffic share count is 1

R1-CE# **show interfaces tunnel 0**

Tunnel0 is up, line protocol is up
Hardware is Tunnel
Internet address is 200.200.200.1/24
MTU 1514 bytes, BW 9 Kbit, DLY 500000 usec,
reliability 255/255, txload 1/255, rxload 1/255


```
Encapsulation TUNNEL, loopback not set
Keepalive not set
Tunnel source 10.10.10.1 (Ethernet0/0), destination 20.20.20.3
Tunnel protocol/transport GRE/IP, key disabled, sequencing disabled
Tunnel TTL 255
Checksumming of packets disabled, fast tunneling enabled
Last input 00:26:57, output 00:26:57, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/0 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
83 packets input, 10292 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
106 packets output, 12088 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets
0 output buffer failures, 0 output buffers swapped out
```

```
R5-CE# ping 200.200.200.1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 200.200.200.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 40/54/80 ms

```
R5-CE# ping 200.200.200.3
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 200.200.200.3, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 20/36/72 ms

故障排除

目前没有针对此配置的故障排除信息。

注意事项

下面这些是针对此功能的配置而发现的已知警告。您可以使用 [Bug 工具包 \(仅限注册用户\)](#) 搜索 Bug。

- [CSCea81266](#)(仅注册客户) — 已解析(R)GRE:发出 `clear ip route *` 命令后, 数据流的传输停止。
- [CSCdx74855](#)(仅注册客户) — 已解析(R)无法ping本地GRE隧道接口的IP地址。
- [CSCdx57718](#)(仅注册客户) — 当Cisco快速转发(CEF)在传出接口上禁用时,GRE隧道中已解决(R)IP数据包丢失问题。

相关信息

- [MPLS 技术支持页](#)
- [技术支持和文档 - Cisco Systems](#)