

# 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

有关文档规则的详细信息，请参阅 [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。

**注意：**要查找本文档所用命令的其他信息，请使用[命令查找工具](#)（[仅限注册用户](#)）。

## 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
 tunnel !--- 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 设备上发出此命令可查看通过边界网关协议 (BGP) 为每个前缀分发到其他 PE 设备的 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。

## 警告

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](#) ( 仅限[注册](#)用户 ) - 已解决 (R) GRE : 发出 `clear ip route ?` 命令后 , 数据流的传输停止。



- [CSCdx74855](#) ( 仅限[注册](#)用户 ) - *已解决 (R)* 无法 ping 通本地 GRE 隧道接口的 IP 地址。
- [CSCdx57718](#) ( 仅限[注册](#)用户 ) - *已解决 (R)* 在传出接口上禁用 Cisco Express Forwarding (CEF) 后，IP 数据包在 GRE 隧道中丢失。

## [相关信息](#)

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