

# 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 no-label/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](#)