Exemplo de configuração de MPLS/VPN com EIGRP no lado do cliente

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Introduction

Este documento fornece uma configuração de exemplo de uma Virtual Private Network (VPN) de Multiprotocol Label Switching (MPLS) quando o EIGRP (Enhanced Interior Gateway Routing Protocol) está presente no lado do cliente.

Este documento fornece uma configuração de exemplo para o EIGRP no lado do cliente em um ambiente MPLS/VPN. Esses cenários são detalhados:

- Dois pontos de extremidade de conexão (CEs) que pertencem aos mesmos sistemas autônomos EIGRP.
- Dois CEs que pertencem a sistemas autônomos EIGRP diferentes.

Em ambos os cenários, você recebe as etapas de configuração e verificação. Um exemplo de troca de roteamento para ambos os protocolos envolvidos — BGP (Border Gateway Protocol) e EIGRP — também é fornecido.

Quando usado com MPLS, o recurso VPN permite que vários sites se interconectem de forma transparente através de uma rede de provedor de serviços. Uma rede de provedor de serviços pode suportar várias VPNs de IPs diferentes. Cada uma delas aparece para seus usuários como uma rede privada, separada de todas as outras redes. Na VPN, cada site pode enviar pacotes IP

para qualquer outro site na mesma VPN.

Cada VPN está associado a uma ou mais instâncias de roteamento/encaminhamento (VRFs) de VPN. Um VRF consiste em uma tabela de IP Routing, uma tabela de Cisco Express Forwarding (CEF) derivada e um conjunto de interfaces que usam essa tabela de encaminhamento.

O roteador mantém um roteamento separado e tabela de CEF para cada VRF. Isso evita que as informações sejam enviadas para fora da VPN e permite que a mesma sub-rede seja utilizada em várias VPNs sem provocar problemas de endereço IP duplicado.

O roteador que usa o Multiprotocol BGP (MP-BGP) distribui as informações de roteamento VPN usando as comunidades estendidas MP-BGP.

Consulte estes documentos para obter mais informações sobre a propagação de atualizações através de uma VPN:

- Configuração de redes privadas virtuais MPLS
- Fluxo de pacote em um ambiente de MPLS VPN
- Configurando MPLS básico utilizando OSPF

Prerequisites

Requirements

Não existem requisitos específicos para este documento.

Componentes Utilizados

Este documento não se restringe a versões de software e hardware específicas.

O recurso EIGRP entre PE e CE no ambiente MPLS/VPN foi introduzido nos Cisco IOS® Software Releases 12.0(22)S e 12.2(15)T.

Produtos Relacionados

Essa configuração também pode ser usada com estas séries de roteadores:

- Cisco 7200
- Cisco 7500
- Cisco 10000
- Cisco 10700
- Cisco 12000
- Processador de rota de desempenho (PRP - Performance Route Processor) da série Cisco 12000

Conventions

Consulte as Convenções de Dicas Técnicas da Cisco para obter mais informações sobre convenções de documentos.

Informações de Apoio

As rotas EIGRP são convertidas em rotas BGP no backbone do provedor de serviços por novos atributos de comunidade estendida específicos do EIGRP. O roteador de borda do provedor (PE) usa o BGP para distribuir as informações de roteamento VPN usando os atributos de comunidade estendida específicos do EIGRP, que são anexados à rota BGP. As rotas BGP são convertidas novamente em rotas EIGRP pelos atributos de comunidade estendida específicos do EIGRP quando eles atingem o roteador PE que está conectado ao CE (roteador de ponta) do cliente de destino.

Esta tabela descreve os atributos da comunidade estendida que são anexados às rotas BGP e usados para transportar informações do EIGRP através do backbone do provedor de serviços.

Atributo EIGRP	Tipo	Uso	Valor
General	0x8800	Informações de Rota Geral do EIGRP	Flag e identificação da rota
Métrico	0x8801	Informações de Métrica de Rota EIGRP e Sistema Autônomo	Sistema autônomo e atraso
	0x8802	Informações da Métrica de Rota do EIGRP	Confiabilidade, Salto Seguinte e Largura de Banda
	0x8803	Informações da Métrica de Rota do EIGRP	Reserva, Carga e Unidade de Transmissão Máxima (MTU)
Externos	0x8804	Informações de Rota Externa do EIGRP	Sistema Autônomo Remoto e ID Remota
	0x8805	Informações de Rota Externa do EIGRP	Protocolo Remoto e Métrica Remota

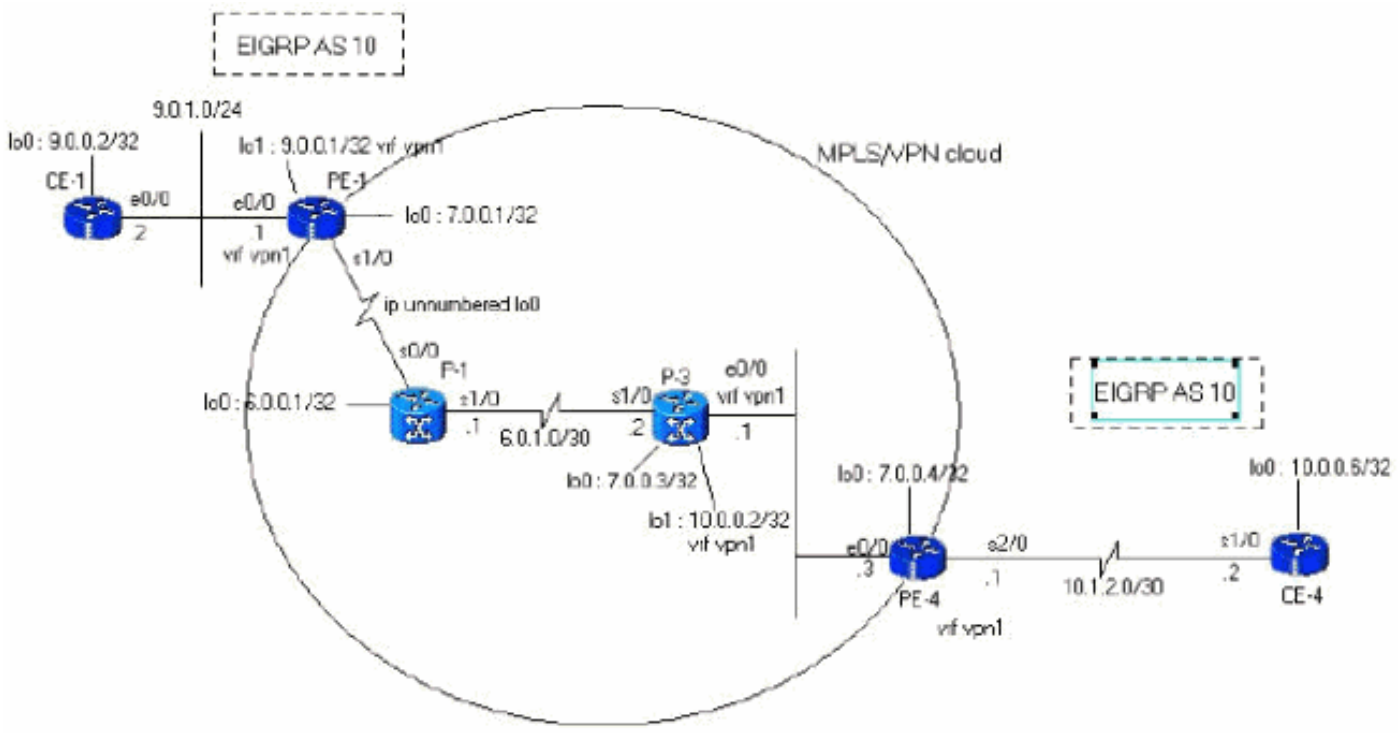
Cenário 1: Configurar um único sistema autônomo EIGRP

Nesta seção, você encontrará informações para configurar os recursos descritos neste documento.

Nota: Use a Command Lookup Tool (somente clientes registrados) para obter mais informações sobre os comandos usados nesta seção.

Diagrama de Rede

Essa seção utiliza esta configuração de rede:



Configurações

Esta seção utiliza as seguintes configurações:

PE-1

```
PE-1#show run
Building configuration...
ip cef
!--- vpn1 commands. ip vrf vpn1 !--- Enables the VPN
routing and forwarding (VRF) routing table. !--- This
command can be used in global or !--- router
configuration mode. rd 100:1 !--- Route distinguisher
creates routing and forwarding !--- tables for a VRF.
route-target export 100:1 !--- Creates lists of import
and export route-target extended !--- communities for
the specified VRF. route-target import 100:1 ! interface
Loopback0 ip address 7.0.0.1 255.255.255.255 no ip
directed-broadcast ! interface Ethernet0/0 ip vrf
forwarding vpn1 !--- Associates a VRF instance with an
interface or subinterface. ip address 9.0.1.1
255.255.255.0 no ip directed-broadcast ! router eigrp 1
! address-family ipv4 vrf vpn1
!--- To enter address family configuration mode !--- for
configuring EIGRP routing sessions, !--- that use
standard VPN version 4 address prefixes. redistribute
bgp 1
!--- Enables redistribution of bgp into this specific
instance of EIGRP. network 9.0.0.0 default-metric 10000
1 255 1 1500
 no auto-summary
 autonomous-system 10
!--- Defines the autonomous system number for this
specific instance of EIGRP. exit-address-family ! router
bgp 1 no bgp default ipv4-unicast bgp log-neighbor-
changes neighbor 7.0.0.4 remote-as 1 !--- Adds an entry
to the BGP or multiprotocol BGP neighbor table. neighbor
```

```
7.0.0.4 update-source Loopback0 !--- Enables BGP
sessions to use a specific operational !--- interface
for TCP connections. ! address-family vpnv4 !--- To
enter address family configuration mode !--- for
configuring routing sessions, such as BGP, !--- that use
standard VPN version 4 address prefixes. neighbor
7.0.0.4 activate neighbor 7.0.0.4 send-community both !-
-- Sends the community attribute to a BGP neighbor. no
auto-summary exit-address-family ! address-family ipv4
neighbor 7.0.0.4 activate exit-address-family ! address-
family ipv4 vrf vpn1 redistribute eigrp 10
!--- Enables redistribution of EIGRP AS 10 into BGP. no
auto-summary no synchronization exit-address-family !
end
```

PE-4

```
PE-4#show running-config
Building configuration...
Current configuration : 2439 bytes
!
ip cef
ip vrf vpn1
 rd 100:1
 route-target export 100:1
 route-target import 100:1
!
!
interface Loopback0
 ip address 7.0.0.4 255.255.255.255
 no ip directed-broadcast
!
interface Ethernet0/0
 ip address 6.0.2.3 255.255.255.0
 no ip directed-broadcast
 tag-switching ip
!
!
interface Serial2/0
 ip vrf forwarding vpn1
 ip address 10.1.2.1 255.255.255.252
 no ip directed-broadcast
!
router eigrp 1
 !
 address-family ipv4 vrf vpn1
 redistribute bgp 1
 network 10.0.0.0
 default-metric 10000 1 255 1 1500
 no auto-summary
 autonomous-system 10
 exit-address-family
!
 router bgp 1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 neighbor 7.0.0.1 remote-as 1
 neighbor 7.0.0.1 update-source Loopback0
 no auto-summary
 !
 address-family vpnv4
 neighbor 7.0.0.1 activate
 neighbor 7.0.0.1 send-community extended
```

```
 no auto-summary
 exit-address-family
 !
 address-family ipv4
 redistribute connected
 neighbor 7.0.0.1 activate
 no auto-summary
 no synchronization
 exit-address-family
 !
 address-family ipv4 vrf vpn1
 redistribute eigrp 10
 no auto-summary
 no synchronization
 network 13.0.0.1 mask 255.255.255.255
 exit-address-family
!
end
```

Verificar

Para verificar sua configuração, use uma abordagem passo a passo e verifique esses pontos na ordem. Conclua estes passos:

1. Verifique se a instância do EIGRP está configurada na interface desejada—verifique o comando **vrf** e o comando network **eigrp** na família de endereços correta.Neste exemplo, o VRF é chamado vpn1.

```
PE-1#show ip vrf vpn1
   Name                              Default RD          Interfaces
   vpn1                              100:1               Ethernet0/0

PE-1#show ip eigrp vrf vpn1 interfaces
 IP-EIGRP interfaces for process 10
                     Xmit Queue   Mean   Pacing Time   Multicast    Pending
Interface    Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Et0/0            1         0/0    103          0/10         416          0
PE-1#
```

2. Verifique se a vizinhança do EIGRP está estabelecida.Neste exemplo, você pode ver que 9.0.1.2 (CE-1) é um vizinho.

```
PE-1#show ip eigrp vrf vpn1 neighbors
 IP-EIGRP neighbors for process 10
H   Address            Interface      Hold Uptime   SRTT   RTO  Q  Seq Type
                                      (sec)         (ms)       Cnt Num
0   9.0.1.2            Et0/0            13 00:30:19  103   618  0  9
   PE-1#
```

3. Verifique se a tabela de topologia EIGRP contém as sub-redes locais obtidas via EIGRP (9.0.0.2/32).

   Neste exemplo, você pode ver que a tabela de topologia EIGRP também contém sub-redes aprendidas no backbone MPLS/VPN (10.1.2.0/30).As sub-redes são exibidas como aprendidas por meio de Redistribuído e tem uma distância reportada 0.

```
PE-1#show ip eigrp vrf vpn1 topology
 IP-EIGRP Topology Table for AS(10)/ID(9.0.0.1) Routing Table: vpn1
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status
P 10.1.3.0/24, 1 successors, FD is 2195456
         via Redistributed (2195456/0)
P 9.0.1.0/24, 1 successors, FD is 281600
```

```
         via Connected, Ethernet0/0
P 9.0.0.1/32, 1 successors, FD is 128256
         via Connected, Loopback1
P 10.1.2.0/30, 1 successors, FD is 2169856
         via Redistributed (2169856/0)
P 9.1.0.2/32, 1 successors, FD is 45867776
         via 9.0.1.2 (45867776/45842176), Ethernet0/0
P 9.0.0.2/32, 1 successors, FD is 409600
         via 9.0.1.2 (409600/128256), Ethernet0/0
P 10.0.0.6/32, 1 successors, FD is 2297856
         via Redistributed (2297856/0)
P 13.0.0.1/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
PE-1#
```

4. Se as sub-redes estiverem ausentes, verifique se estão na tabela BGP com estes comandos **show** para um VRF específico.Se a redistribuição entre BGP e EIRGP não estiver configurada corretamente, você poderá ver a sub-rede em uma tabela e não na outra.

```
PE-1#show ip bgp vpnv4 vrf vpn1
BGP table version is 45, local router ID is 7.0.0.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:1 (default for vrf vpn1)
*> 9.0.0.1/32       0.0.0.0                  0         32768 ?
*> 9.0.0.2/32       9.0.1.2             409600         32768 ?
*> 9.0.1.0/24       0.0.0.0                  0         32768 ?
*> 9.1.0.2/32       9.0.1.2           45867776         32768 ?
*>i10.0.0.6/32      7.0.0.4            2297856    100      0 ?
*>i10.1.2.0/30      7.0.0.4                  0    100      0 ?
*>i10.1.3.0/24      7.0.0.4            2195456    100      0 ?
*>i13.0.0.1/32      7.0.0.4                  0    100      0 i
PE-1#

PE-1#show ip bgp vpnv4 vrf vpn1 9.0.0.1 255.255.255.255
BGP routing table entry for 100:1:9.0.0.1/32, version 12
Paths: (1 available, best #1, table vpn1)
  Advertised to update-groups:
     1
          Local
    0.0.0.0 (via vpn1) from 0.0.0.0 (7.0.0.1)
      Origin incomplete, metric 0, localpref 100, weight 32768,
valid, sourced, best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:10:128000
 0x8802:65280:256 0x8803:65281:1514
PE-1#

PE-1# show ip bgp vpnv4 vrf vpn1 10.1.2.0 255.255.255.252
BGP routing table entry for 100:1:10.1.2.0/30, version 40
Paths: (1 available, best #1, table vpn1)
  Not advertised to any peer
  Local
    7.0.0.4 (metric 139) from 7.0.0.4 (7.0.0.4)
      Origin incomplete, metric 0, localpref 100, valid, internal,
 best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:10:512000
 0x8802:65280:1657856 0x8803:65281:1500
```

Os mesmos comandos **show** devem ser usados no PE remoto.Neste exemplo, o PE remoto é PE-4:

```
PE-4#show ip eigrp vrf vpn1 interfaces
 IP-EIGRP interfaces for process 10
```

```
                    Xmit Queue   Mean   Pacing Time   Multicast    Pending
Interface    Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Se1/0            0        0/0         0       0/10           0           0
Se2/0            1        0/0       100       0/15         415           0

PE-4#show ip eigrp vrf vpn1 neighbors
 IP-EIGRP neighbors for process 10
H   Address            Interface      Hold Uptime   SRTT   RTO  Q  Seq Type
                                      (sec)         (ms)       Cnt Num
0   10.1.2.2           Se2/0            10 00:18:57  100   600  0  2

PE-4#show ip eigrp vrf vpn1 topology
 IP-EIGRP Topology Table for AS(10)/ID(13.0.0.1) Routing Table: vpn1
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status
P 10.1.3.0/24, 1 successors, FD is 2195456
         via 10.1.2.2 (2195456/281600), Serial2/0
P 9.0.0.1/32, 1 successors, FD is 128256
         via Redistributed (128256/0)
P 9.0.1.0/24, 1 successors, FD is 281600
         via Redistributed (281600/0)
P 10.1.2.0/30, 1 successors, FD is 2169856
         via Connected, Serial2/0
P 9.1.0.2/32, 1 successors, FD is 45867776
         via Redistributed (45867776/0)
P 9.0.0.2/32, 1 successors, FD is 409600
         via Redistributed (409600/0)
P 10.0.0.6/32, 1 successors, FD is 2297856
         via 10.1.2.2 (2297856/128256), Serial2/0
P 13.0.0.1/32, 1 successors, FD is 256256
         via Redistributed (256256/0)

PE-4#show ip bgp vpnv4 vrf vpn1
 BGP table version is 61, local router ID is 7.0.0.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:1 (default for vrf vpn1)
*>i9.0.0.1/32       7.0.0.1                  0    100      0 ?
*>i9.0.0.2/32       7.0.0.1             409600    100      0 ?
*>i9.0.1.0/24       7.0.0.1                  0    100      0 ?
*>i9.1.0.2/32       7.0.0.1           45867776    100      0 ?
*> 10.0.0.6/32      10.1.2.2           2297856         32768 ?
*> 10.1.2.0/30      0.0.0.0                  0         32768 ?
*> 10.1.3.0/24      10.1.2.2           2195456         32768 ?
*> 13.0.0.1/32      0.0.0.0                  0         32768 i

PE-4#show ip bgp vpnv4 vrf vpn1 9.0.0.1 255.255.255.255
BGP routing table entry for 100:1:9.0.0.1/32, version 45
Paths: (1 available, best #1, table vpn1)
  Not advertised to any peer
  Local
    7.0.0.1 (metric 139) from 7.0.0.1 (7.0.0.1)
      Origin incomplete, metric 0, localpref 100, valid, internal,
 best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:10:128000
 0x8802:65280:
256 0x8803:65281:1514

PE-4#show ip bgp vpnv4 vrf vpn1 10.1.2.0 255.255.255.252
BGP routing table entry for 100:1:10.1.2.0/30, version 56
Paths: (1 available, best #1, table vpn1)
  Advertised to update-groups:
```

```
     1
           Local
    0.0.0.0 (via vpn1) from 0.0.0.0 (7.0.0.4)
      Origin incomplete, metric 0, localpref 100, weight 32768,
valid, sourced,
 best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:10:512000
 0x8802:65280:
1657856 0x8803:65281:1500

PE-4#
CE-1#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
Gateway of last resort is not set
     9.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       9.0.1.0/24 is directly connected, Ethernet0/0
D       9.0.0.1/32 [90/409600] via 9.0.1.1, 1d02h, Ethernet0/0
C       9.1.0.2/32 is directly connected, Loopback1
C       9.0.0.2/32 is directly connected, Loopback0
     10.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
D       10.1.3.0/24 [90/2221056] via 9.0.1.1, 1d02h, Ethernet0/0
D       10.1.2.0/30 [90/2195456] via 9.0.1.1, 1d02h, Ethernet0/0
D       10.0.0.6/32 [90/2323456] via 9.0.1.1, 1d02h, Ethernet0/0
     13.0.0.0/32 is subnetted, 1 subnets
D EX    13.0.0.1 [170/281856] via 9.0.1.1, 1d02h, Ethernet0/0
```

Troubleshooting

Nesta seção, são fornecidas informações sobre a consulta eigrp recebida pelo PE e a atualização BGP correspondente enviada através da nuvem MPLS/VPN. Isso é feito para a sub-rede 10.0.0.6/32 diretamente conectada ao roteador CE-4 no lado direito do diagrama. Um comando 'shut' e 'no shut' executado na interface de loopback em CE-4 junto com o comando de depuração apropriado o ajuda a entender os acionadores.

Propagação de atualização em um único sistema autônomo

Esses comandos **debug** são usados para rastrear as atualizações da sub-rede 10.0.0.6/32 (endereço de loopback do CE-4):

- **debug eigrp fsm**
- **debug eigrp packets query reply request update**
- **debug ip eigrp 10 10.0.0.6 255.255.255.255**
- **debug ip bgp vpnv4**
- **debug ip bgp update**

Este exemplo mostra uma entrada EIGRP retirada depois que um comando **shut** é executado na interface loopback0 em CE-4:

```
PE-4
*Apr 30 08:36:59.913: DUAL: dual_rcvquery():10.0.0.6/32 via 10.1.2.2
metric 4294967295/4294967295, RD is 2297856
*Apr 30 08:36:59.913: DUAL: Find FS for dest 10.0.0.6/32. FD is 2297856,
```

```
RD is 2297856
*Apr 30 08:36:59.913: DUAL:     10.1.2.2 metric 4294967295/4294967295 not
 found Dmin is 4294967295
*Apr 30 08:36:59.913: DUAL: Dest 10.0.0.6/32 (Split Horizon) not entering
 active state.
*Apr 30 08:36:59.913: DUAL: Send reply about 10.0.0.6/32 to 10.1.2.2
*Apr 30 08:36:59.965: vpn: bgp_router, vpn ipv4 redistQ len = 1
*Apr 30 08:36:59.965: BGP(2): route 100:1:10.0.0.6/32 down
*Apr 30 08:36:59.965: BGP(2): no valid path for 100:1:10.0.0.6/32
*Apr 30 08:36:59.965: BGP(2): nettable_walker 100:1:10.0.0.6/32 no best path
*Apr 30 08:37:00.085: DUAL: Removing dest 10.0.0.6/32, nexthop 10.1.2.2
*Apr 30 08:37:00.085: DUAL: No routes.  Flushing dest 10.0.0.6/32
*Apr 30 08:37:00.961: vpn: bgp_router, vpn ipv4 redistQ len = 1
*Apr 30 08:37:00.961: BGP(2): route 100:1:10.0.0.6/32 down
*Apr 30 08:37:01.993: BGP(2): 7.0.0.1 computing updates, afi 2, neighbor
version 73, table version 74, starting at 0.0.0.0
*Apr 30 08:37:01.993: BGP(2): 7.0.0.1 send unreachable 100:1:10.0.0.6/32
*Apr 30 08:37:01.993: BGP(2): 7.0.0.1 send UPDATE 100:1:10.0.0.6/32 --
unreachable
*Apr 30 08:37:01.993: BGP(2): 1 updates (average = 45, maximum = 45)
*Apr 30 08:37:01.993: BGP(2): 7.0.0.1 updates replicated for neighbors:
*Apr 30 08:37:01.993: BGP(2): 7.0.0.1 update run completed, afi 2, ran for
 0ms, neighbor version 74, start version 74, throttled to 74
*Apr 30 08:37:05.925: BGP: Import walker start version 73, end version
74*Apr 30 08:37:05.925: BGP: ... start import cfg version = 0

PE-1
*Apr 30 08:35:04.069: BGP(2): 7.0.0.4 rcv UPDATE about 100:1:10.0.0.6/32
 -- withdrawn
*Apr 30 08:35:04.069: BGP: Withdraw path from 7.0.0.4
*Apr 30 08:35:04.069: BGP(2): no valid path for 100:1:10.0.0.6/32
*Apr 30 08:35:04.089: BGP(2): nettable_walker 100:1:10.0.0.6/32 no best path
*Apr 30 08:35:04.109: DUAL: dual_rcvupdate(): 10.0.0.6/32 via Redistributed
metric 4294967295/4294967295
*Apr 30 08:35:04.109: DUAL: Find FS for dest 10.0.0.6/32. FD is 2297856,
 RD is 2297856
*Apr 30 08:35:04.109: DUAL:     0.0.0.0 metric 4294967295/4294967295 not
 found Dmin is 4294967295
*Apr 30 08:35:04.109: DUAL: Dest 10.0.0.6/32 entering active state.
*Apr 30 08:35:04.109: DUAL: Set reply-status table. Count is 1.
*Apr 30 08:35:04.109: DUAL: Not doing split horizon
*Apr 30 08:35:04.137: EIGRP: Enqueueing QUERY on Ethernet0/0 iidbQ un/rely
 0/1 serno 35-35
*Apr 30 08:35:04.169: EIGRP: Sending QUERY on Ethernet0/0
*Apr 30 08:35:04.169:   AS 10, Flags 0x0, Seq 17/0 idbQ 0/0 iidbQ un/rely
 0/0 serno 35-35
*Apr 30 08:35:04.349: EIGRP: Received REPLY on Ethernet0/0 nbr 9.0.1.2
*Apr 30 08:35:04.349:   AS 10, Flags 0x0, Seq 16/17 idbQ 0/0 iidbQ un/rely
 0/0 peerQ un/rely 0/0
*Apr 30 08:35:04.349: DUAL: dest(10.0.0.6/32) active
*Apr 30 08:35:04.349: DUAL: dual_rcvreply(): 10.0.0.6/32 via 9.0.1.2 metric
 4294967295/4294967295
*Apr 30 08:35:04.349: DUAL: Count is 1*Apr 30 08:35:04.349: DUAL: Clearing
 handle 0, count is now 0
*Apr 30 08:35:04.349: DUAL: Freeing reply status table
*Apr 30 08:35:04.349: DUAL: Find FS for dest 10.0.0.6/32. FD is 4294967295,
 RD is 4294967295 found
*Apr 30 08:35:04.349: DUAL: Removing dest 10.0.0.6/32, nexthop 0.0.0.0
*Apr 30 08:35:04.349: DUAL: Removing dest 10.0.0.6/32, nexthop 9.0.1.2
*Apr 30 08:35:04.349: DUAL: No routes.  Flushing dest 10.0.0.6/32

PE-1#
CE-1
*Apr 30 08:26:30.813: EIGRP: Received QUERY on Ethernet0/0 nbr 9.0.1.1
```

```
*Apr 30 08:26:30.813:   AS 10, Flags 0x0, Seq 13/0 idbQ 0/0 iidbQ un/rely
 0/0 peerQ un/rely 0/0
*Apr 30 08:26:30.813: DUAL: dual_rcvquery():10.0.0.6/32 via 9.0.1.1 metric
 4294967295/4294967295, RD is 2323456
*Apr 30 08:26:30.813: DUAL: Find FS for dest 10.0.0.6/32. FD is 2323456,
 RD is 2323456
*Apr 30 08:26:30.813: DUAL:     9.0.1.1 metric 4294967295/4294967295 not
 found Dmin is 4294967295
*Apr 30 08:26:30.813: DUAL: Dest 10.0.0.6/32 (Split Horizon) not entering
 active state.
*Apr 30 08:26:30.813: DUAL: Send reply about 10.0.0.6/32 to 9.0.1.1
*Apr 30 08:26:30.849: EIGRP: Enqueueing REPLY on Ethernet0/0 nbr 9.0.1.1
iidbQ un/rely 0/1 peerQ un/rely 0/0 serno 31-31
*Apr 30 08:26:30.877: EIGRP: Sending REPLY on Ethernet0/0 nbr 9.0.1.1
*Apr 30 08:26:30.877:   AS 10, Flags 0x0, Seq 12/13 idbQ 0/0 iidbQ un/rely
 0/0 peerQ un/rely 0/1 serno 31-31
*Apr 30 08:26:30.989: DUAL: Removing dest 10.0.0.6/32, nexthop 9.0.1.1
*Apr 30 08:26:30.989: DUAL: No routes.  Flushing dest 10.0.0.6/32
```

Este exemplo mostra a criação de uma entrada EIGRP após a execução de um comando **no shut** na interface loopback0 em CE-4:

```
PE-4
*Apr 30 08:38:53.685: DUAL: dest(10.0.0.6/32) not active
*Apr 30 08:38:53.685: DUAL: dual_rcvupdate(): 10.0.0.6/32 via 10.1.2.2
 metric 2297856/128256
*Apr 30 08:38:53.685: DUAL: Find FS for dest 10.0.0.6/32. FD is 4294967295,
 RD is 4294967295 found
*Apr 30 08:38:53.685: vpn: tag_vpn_find_route_tags: 100:1:10.0.0.6
*Apr 30 08:38:53.685: DUAL: RT installed 10.0.0.6/32 via 10.1.2.2
*Apr 30 08:38:53.685: DUAL: Send update about 10.0.0.6/32.  Reason: metric chg
*Apr 30 08:38:53.685: DUAL: Send update about 10.0.0.6/32.  Reason: new if
*Apr 30 08:38:53.745: vpn: bgp_router, vpn ipv4 redistQ len = 1
*Apr 30 08:38:53.745: BGP(2): route 100:1:10.0.0.6/32 up
*Apr 30 08:38:53.745: vpn: bgp allocate label: route_tag_change for
vpn1:10.0.0.6/255.255.255.255
*Apr 30 08:38:53.745: vpn: tag_vpn_find_route_tags: 100:1:10.0.0.6
*Apr 30 08:38:53.745: vpn: intag=21, outtag=unknown, outtag owner=BGP
*Apr 30 08:38:53.745: BGP(2): nettable_walker 100:1:10.0.0.6/32 route
sourced locally
*Apr 30 08:38:55.813: BGP(2): 7.0.0.1 computing updates, afi 2, neighbor
 version 77, table version 78, starting at 0.0.0.0
*Apr 30 08:38:55.813: BGP(2): 7.0.0.1 send UPDATE (format) 100:1:10.0.0.6/32,
 next 7.0.0.4, metric 2297856, path , extended community RT:100:1 0x8800:32768:0
 0x8801:10:640000 0x8802:65281:1657856 0x8803:65281:1500
*Apr 30 08:38:55.813: BGP(2): 1 updates (average = 123, maximum = 123)
*Apr 30 08:38:55.813: BGP(2): 7.0.0.1 updates replicated for neighbors:
*Apr 30 08:38:55.813: BGP(2): 7.0.0.1 update run completed, afi 2, ran
for 0ms, neighbor version 78, start version 78, throttled to 78
*Apr 30 08:39:07.053: BGP: Import walker start version 77, end version 78
*Apr 30 08:39:07.053: BGP: ... start import cfg version = 0
*Apr 30 08:39:07.053: vpn: vpn1 same RD import, do best path
*Apr 30 08:39:07.053: vpn: bgp allocate label: route_tag_change for
vpn1:10.0.0.6/255.255.255.255
*Apr 30 08:39:07.053: vpn: tag_vpn_find_route_tags: 100:1:10.0.0.6
*Apr 30 08:39:07.053: vpn: intag=21, outtag=unknown, outtag owner=BGP
*Apr 30 08:39:07.305: BGP(2): nettable_walker 100:1:10.0.0.6/32 route
sourced locally
*Apr 30 08:39:09.413: BGP(2): 7.0.0.1 computing updates, afi 2, neighbor
 version 78, table version 79, starting at 0.0.0.0
*Apr 30 08:39:09.413: BGP(2): 7.0.0.1 send UPDATE (format) 100:1:10.0.0.6/32,
```

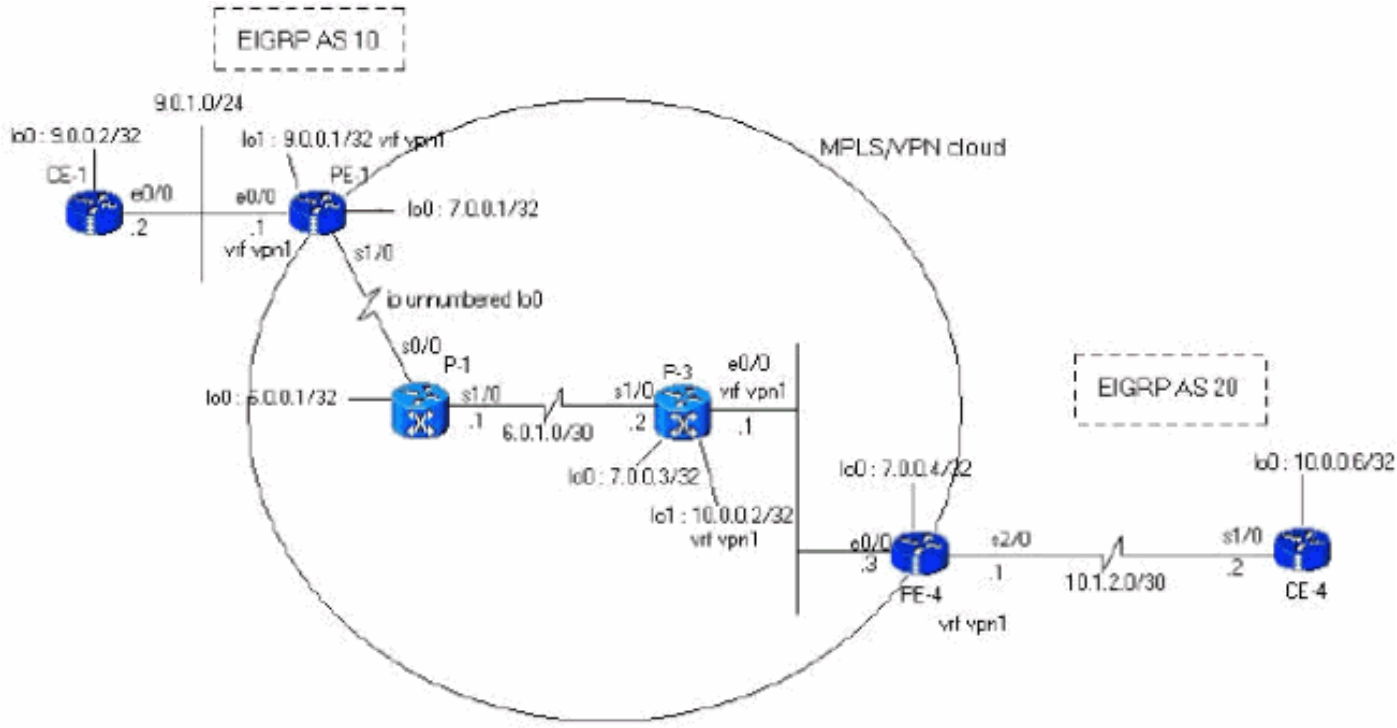
```
 next 7.0.0.4, metric 2297856, path , extended community RT:100:1 0x8800:32768:0
 0x8801:10:640000 0x8802:65281:1657856 0x8803:65281:1500
*Apr 30 08:39:09.413: BGP(2): 1 updates (average = 123, maximum = 123)
*Apr 30 08:39:09.413: BGP(2): 7.0.0.1 updates replicated for neighbors:
*Apr 30 08:39:09.413: BGP(2): 7.0.0.1 update run completed, afi 2, ran for
0ms, neighbor version 79, start version 79, throttled to 79

PE-1
*Apr 30 08:35:36.409: BGP: 7.0.0.3 multihop open delayed 15100ms (no route)
*Apr 30 08:35:37.981: BGP: Incoming path from 7.0.0.4
*Apr 30 08:35:37.981: BGP(2): 7.0.0.4 rcvd UPDATE w/ attr: nexthop 7.0.0.4,
 origin ?, localpref 100, metric 2297856, extended community RT:100:1
0x8800:32768:0 0x8801:10:640000 0x8802:65281:1657856 0x8803:65281:1500
*Apr 30 08:35:37.981: BGP(2): 7.0.0.4 rcvd 100:1:10.0.0.6/32
*Apr 30 08:35:37.981: vpn: bgp_vpnv4_bnetinit: 100:1:10.0.0.6/32
*Apr 30 08:35:37.981: BGP: Accepted path from 7.0.0.4
*Apr 30 08:35:38.001: BGP(2): nettable_walker 100:1:10.0.0.6/32 no RIB
*Apr 30 08:35:38.189: BGP(2): 7.0.0.4 computing updates, afi 2, neighbor
 version 55, table version 56, starting at 0.0.0.0
*Apr 30 08:35:38.189: BGP(2): 7.0.0.4 update run completed, afi 2,
ran for 0ms, neighbor version 56, start version 56, throttled to 56
*Apr 30 08:35:39.081: BGP: 7.0.0.2 multihop open delayed 16412ms (no route)
*Apr 30 08:35:50.437: BGP: Import walker start version 55, end version 56
*Apr 30 08:35:50.437: BGP: ... start import cfg version = 0
*Apr 30 08:35:50.437: vpn: vpn1 same RD import, do best path
*Apr 30 08:35:50.869: BGP(2): Revise route installing 1 of 1 route
for10.0.0.6/32 -> 7.0.0.4(main) to vpn1 IP table
*Apr 30 08:35:50.889: DUAL: dest(10.0.0.6/32) not active
*Apr 30 08:35:50.889: DUAL: dual_rcvupdate(): 10.0.0.6/32 via Redistributed
 metric 2297856/0
*Apr 30 08:35:50.889: DUAL: Find FS for dest 10.0.0.6/32. FD is 4294967295,
 RD is 4294967295 found
*Apr 30 08:35:50.889: DUAL: RT installed 10.0.0.6/32 via 0.0.0.0
*Apr 30 08:35:50.889: DUAL: Send update about 10.0.0.6/32.  Reason:
metric chg
*Apr 30 08:35:50.889: DUAL: Send update about 10.0.0.6/32.  Reason:
new if
*Apr 30 08:35:50.929: EIGRP: Enqueueing UPDATE on Ethernet0/0 iidbQ
un/rely 0/1 serno 36-36
*Apr 30 08:35:50.957: EIGRP: Sending UPDATE on Ethernet0/0
*Apr 30 08:35:50.957:   AS 10, Flags 0x0, Seq 18/0 idbQ 0/0 iidbQ un/rely
 0/0 serno 36-36
*Apr 30 08:35:51.149: EIGRP: Received UPDATE on Ethernet0/0 nbr 9.0.1.2
*Apr 30 08:35:51.149:   AS 10, Flags 0x0, Seq 17/0 idbQ 0/0 iidbQ un/rely
 0/0 peerQ un/rely 0/0
*Apr 30 08:35:51.417: vpn: tag_vpn_find_route_tags: 100:1:10.0.0.6
*Apr 30 08:35:51.417: vpn: intag=vpn-route, outtag=20, outtag owner=BGPCE-1
*Apr 30 08:28:17.669: EIGRP: Received UPDATE on Ethernet0/0 nbr 9.0.1.1
*Apr 30 08:28:17.669:   AS 10, Flags 0x0, Seq 14/0 idbQ 0/0 iidbQ un/rely
 0/0 peerQ un/rely 0/0
*Apr 30 08:28:17.669: DUAL: dest(10.0.0.6/32) not active
*Apr 30 08:28:17.669: DUAL: dual_rcvupdate(): 10.0.0.6/32 via 9.0.1.1
metric 2323456/2297856
*Apr 30 08:28:17.669: DUAL: Find FS for dest 10.0.0.6/32. FD is 4294967295,
 RD is 4294967295 found
*Apr 30 08:28:17.669: DUAL: RT installed 10.0.0.6/32 via 9.0.1.1
*Apr 30 08:28:17.669: DUAL: Send update about 10.0.0.6/32.  Reason:
 metric chg
*Apr 30 08:28:17.669: DUAL: Send update about 10.0.0.6/32.  Reason:
 new if
*Apr 30 08:28:17.709: EIGRP: Enqueueing UPDATE on Ethernet0/0 iidbQ
un/rely 0/1 serno 32-32
*Apr 30 08:28:17.737: EIGRP: Sending UPDATE on Ethernet0/0
*Apr 30 08:28:17.737:   AS 10, Flags 0x0, Seq 13/0 idbQ 0/0 iidbQ un/rely
```

0/0 serno 32-32

Cenário 2: Configurar um Sistema Autônomo EIGRP Múltiplo

Diagrama de Rede

Essa seção utiliza esta configuração de rede:



Configurações

Esta seção utiliza as seguintes configurações:

PE-1

```
PE-1#show run
Building configuration...
ip cef
ip vrf vpn1
 rd 100:1
 route-target export 100:1
 route-target import 100:1
!
interface Loopback0
 ip address 7.0.0.1 255.255.255.255
 no ip directed-broadcast
!
interface Ethernet0/0
 ip vrf forwarding vpn1
 ip address 9.0.1.1 255.255.255.0
 no ip directed-broadcast
!
router eigrp 1
 !
 address-family ipv4 vrf vpn1
 redistribute bgp 1
 network 9.0.0.0
```

```
 default-metric 10000 1 255 1 1500
 no auto-summary
 autonomous-system 10
 exit-address-family
!
router bgp 1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 neighbor 7.0.0.4 remote-as 1
 neighbor 7.0.0.4 update-source Loopback0
!
 address-family vpnv4
 neighbor 7.0.0.4 activate
 neighbor 7.0.0.4 send-community both
 no auto-summary exit-address-family
!
 address-family ipv4
 neighbor 7.0.0.4 activate
 exit-address-family
!
 address-family ipv4 vrf vpn1
 redistribute eigrp 10
 no auto-summary
 no synchronization
 exit-address-family
!
end
```

PE-4

```
PE-4#show running-config
Building configuration...
Current configuration : 2439 bytes
!
ip cef
ip vrf vpn1
 rd 100:1
 route-target export 100:1
 route-target import 100:1
!
!
interface Loopback0
 ip address 7.0.0.4 255.255.255.255
 no ip directed-broadcast
!
interface Ethernet0/0
 ip address 6.0.2.3 255.255.255.0
 no ip directed-broadcast
 tag-switching ip
!
!
interface Serial2/0
 ip vrf forwarding vpn1
 ip address 10.1.2.1 255.255.255.252
 no ip directed-broadcast
!
router eigrp 1
 !
 address-family
 ipv4 vrf vpn1
 redistribute bgp 1
 network 10.0.0.0
 default-metric 10000 1 255 1 1500
```

```
 no auto-summary
 autonomous-system 20
!--- The autonomous system is different from Scenario 1.
exit-address-family ! router bgp 1 no bgp default ipv4-
unicast bgp log-neighbor-changes neighbor 7.0.0.1
remote-as 1 neighbor 7.0.0.1 update-source Loopback0 no
auto-summary ! address-family vpnv4 neighbor 7.0.0.1
activate neighbor 7.0.0.1 send-community extended no
auto-summary exit-address-family ! address-family ipv4
redistribute connected neighbor 7.0.0.1 activate no
auto-summary no synchronization exit-address-family !
address-family ipv4 vrf vpn1 redistribute eigrp 20
!--- The autonomous system is different from Scenario 1.
no auto-summary no synchronization network 13.0.0.1 mask
255.255.255.255 exit-address-family ! end
```

Verificar

Use estes comandos para verificar sua configuração:

- show ip eigrp vrf vpn1 interfaces
- show ip eigrp vrf vpn1 neighbors
- show ip eigrp vrf vpn1 topology

```
IP-EIGRP Topology Table for AS(10)/ID(9.0.0.1) Routing Table: vpn1
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status
P 10.1.3.0/24, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 9.0.1.0/24, 1 successors, FD is 281600
         via Connected, Ethernet0/0
P 9.0.0.1/32, 1 successors, FD is 128256
         via Connected, Loopback1
P 10.1.2.0/30, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 9.1.0.2/32, 1 successors, FD is 45867776
         via 9.0.1.2 (45867776/45842176), Ethernet0/0
P 9.0.0.2/32, 1 successors, FD is 409600
         via 9.0.1.2 (409600/128256), Ethernet0/0
P 13.0.0.1/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 10.0.0.6/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 10.0.0.7/32, 1 successors, FD is 256256
         via Redistributed (256256/0)

PE-1#show ip bgp vpnv4 vrf vpn1
 BGP table version is 99, local router ID is 7.0.0.1
Status codes: s suppressed, d damped, h history, * valid, > best,
 i - internal,

              S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:1 (default for vrf vpn1)
*> 9.0.0.1/32       0.0.0.0                  0         32768 ?
*> 9.0.0.2/32       9.0.1.2             409600         32768 ?
*> 9.0.1.0/24       0.0.0.0                  0         32768 ?
*> 9.1.0.2/32       9.0.1.2           45867776         32768 ?
*>i10.0.0.6/32      7.0.0.4            2297856    100      0 ?
```

```
*>i10.0.0.7/32      7.0.0.4            2323456    100      0 ?
*>i10.1.2.0/30      7.0.0.4                  0    100      0 ?
*>i10.1.3.0/24      7.0.0.4            2195456    100      0 ?
*>i13.0.0.1/32      7.0.0.4                  0    100      0 i

PE-1#show ip bgp vpnv4 vrf vpn1 9.0.0.1 255.255.255.255
BGP routing table entry for 100:1:9.0.0.1/32, version 12
Paths: (1 available, best #1, table vpn1)
  Advertised to update-groups:
     1
           Local
    0.0.0.0 (via vpn1) from 0.0.0.0 (7.0.0.1)
      Origin incomplete, metric 0, localpref 100, weight 32768, valid,
 sourced, best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:10:128000
 0x8802:65280:256 0x8803:65281:1514

PE-1#show ip bgp vpnv4 vrf vpn1 10.1.2.0 255.255.255.252
BGP routing table entry for 100:1:10.1.2.0/30, version 95
Paths: (1 available, best #1, table vpn1)
  Not advertised to any peer
  Local
    7.0.0.4 (metric 139) from 7.0.0.4 (7.0.0.4)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:20:512000
 0x8802:65280:1657856 0x8803:65281:1500

PE-1#
PE-4#show ip eigrp vrf vpn1 interfaces <output removed>
PE-4#show ip eigrp vrf vpn1 neighbors <output removed>
PE-4#show ip eigrp vrf vpn1 topology
IP-EIGRP Topology Table for AS(20)/ID(13.0.0.1) Routing Table: vpn1
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status
P 9.0.1.0/24, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 9.0.0.1/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 10.1.3.0/24, 1 successors, FD is 2195456
         via 10.1.2.2 (2195456/281600), Serial2/0
P 10.1.2.0/30, 1 successors, FD is 2169856
         via Connected, Serial2/0
P 9.1.0.2/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 9.0.0.2/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 13.0.0.1/32, 1 successors, FD is 256256
         via Redistributed (256256/0)
P 10.0.0.6/32, 1 successors, FD is 2297856
         via 10.1.2.2 (2297856/128256), Serial2/0
P 10.0.0.7/32, 1 successors, FD is 2323456
         via 10.1.2.2 (2323456/409600), Serial2/0

PE-4#show ip bgp vpnv4 vrf vpn1
BGP table version is 23, local router ID is 7.0.0.4
Status codes: s suppressed, d damped, h history, * valid, > best,
 i - internal,
              S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:1 (default for vrf vpn1)
*>i9.0.0.1/32       7.0.0.1                  0    100      0 ?
*>i9.0.0.2/32       7.0.0.1             409600    100      0 ?
*>i9.0.1.0/24       7.0.0.1                  0    100      0 ?
```

```
*>i9.1.0.2/32       7.0.0.1           45867776    100      0 ?
*> 10.0.0.6/32      10.1.2.2           2297856         32768 ?
*> 10.0.0.7/32      10.1.2.2           2323456         32768 ?
*> 10.1.2.0/30      0.0.0.0                  0         32768 ?
*> 10.1.3.0/24      10.1.2.2           2195456         32768 ?
*> 13.0.0.1/32      0.0.0.0                  0         32768 i

PE-4#show ip bgp vpnv4 vrf vpn1 9.0.0.1 255.255.255.255
BGP routing table entry for 100:1:9.0.0.1/32, version 13
Paths: (1 available, best #1, table vpn1)
  Not advertised to any peer
  Local
    7.0.0.1 (metric 139) from 7.0.0.1 (7.0.0.1)
      Origin incomplete, metric 0, localpref 100, valid, internal, best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:10:128000
 0x8802:65280:256 0x8803:65281:1514

PE-4#show ip bgp vpnv4 vrf vpn1 10.1.2.0 255.255.255.252
BGP routing table entry for 100:1:10.1.2.0/30, version 19
Paths: (1 available, best #1, table vpn1)
  Advertised to update-groups:
     1
          Local
    0.0.0.0 (via vpn1) from 0.0.0.0 (7.0.0.4)
      Origin incomplete, metric 0, localpref 100, weight 32768, valid,
 sourced, best
      Extended Community: RT:100:1 0x8800:32768:0 0x8801:20:512000
 0x8802:65280:1657856 0x8803:65281:1500

PE-4#
CE-1#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
Gateway of last resort is not set
     9.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       9.0.1.0/24 is directly connected, Ethernet0/0
D       9.0.0.1/32 [90/409600] via 9.0.1.1, 1d06h, Ethernet0/0
C       9.1.0.2/32 is directly connected, Loopback1
C       9.0.0.2/32 is directly connected, Loopback0
     10.0.0.0/8 is variably subnetted, 4 subnets, 3 masks
D EX    10.1.3.0/24 [170/281856] via 9.0.1.1, 00:27:15, Ethernet0/0
D EX    10.1.2.0/30 [170/281856] via 9.0.1.1, 00:27:15, Ethernet0/0
D EX    10.0.0.6/32 [170/281856] via 9.0.1.1, 00:27:15, Ethernet0/0
D EX    10.0.0.7/32 [170/281856] via 9.0.1.1, 00:27:15, Ethernet0/0
     13.0.0.0/32 is subnetted, 1 subnets
D EX    13.0.0.1 [170/281856] via 9.0.1.1, 00:27:15, Ethernet0/0

CE-1#show ip eigrp topology 10 10.1.2.0 255.255.255.252
IP-EIGRP topology entry for 10.1.2.0/30
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 281856
  Routing Descriptor Blocks:
  9.0.1.1 (Ethernet0/0), from 9.0.1.1, Send flag is 0x0
      Composite metric is (281856/256256), Route is External
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 1010 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
```

```
      External data:
        Originating router is 9.0.0.1
        AS number of route is 1
        External protocol is BGP, external metric is 0
        Administrator tag is 0 (0x00000000)
CE-1#
```

Informações Relacionadas

- Página de suporte de EIGRP
- MPLS Support Page
- Suporte Técnico e Documentação - Cisco Systems