Ejemplo de Configuración de MPLS/VPN con EIGRP en el Lado del Cliente

Contenido

Introducción

Este documento proporciona una configuración de muestra de Red Privada Virtual (VPN) Multiprotocol Label Switching (MPLS) cuando está presente EIGRP (Enhanced Interior Gateway Routing Protocol) en el lado del cliente.

Este documento le proporciona un ejemplo de configuración de EIGRP del lado del cliente en un entorno MPLS/VPN. Estos escenarios son detallados:

- Dos terminales de conexión (CE) que pertenecen a los mismos sistemas autónomos EIGRP.
- Dos CE que pertenecen a diferentes sistemas autónomos EIGRP.

Para ambos escenarios, se le presentan los pasos de configuración y verificación. También se proporciona un ejemplo de intercambio de routing para ambos protocolos implicados: protocolo de gateway fronterizo (BGP) y EIGRP.

Cuando se utiliza con MPLS, la función VPN permite que varios sitios se interconecten de forma transparente a través de una red de proveedor de servicios. Una red proveedora de servicios puede ofrecer soporte a varias VPN IP diferentes Cada una de ellas aparece para sus usuarios como una red privada, independiente del resto de redes. Dentro de una VPN, cada sitio puede enviar paquetes IP a cualquier otro sitio dentro de la misma VPN

Cada VPN está asociada con uno o más casos de reenvío o ruteo VPN (VRF). Un VRF consiste de una tabla de IP Routing, una tabla Cisco Express Forwarding (CEF) derivada y un conjunto de interfaces que usen estas tablas de reenvío.

El router mantiene un ruteo separado y una tabla CEF para cada VRF. Esto impide que la información se envíe fuera de la VPN y permite que pueda usarse la misma subred en varias VPN sin causar problemas de dirección IP duplicada

El router que utiliza BGP multiprotocolo (MP-BGP) distribuye la información de ruteo VPN mediante las comunidades ampliadas MP-BGP.

Consulte estos documentos para obtener más información sobre la propagación de actualizaciones a través de una VPN:

- [Configuración de Redes Privadas Virtuales MPLS](#)
- [Flujo de paquetes en un entorno de VPN MPLS](#)
- [Configuración básica de MPLS usando OSPF](#)

Prerequisites

Requirements

No hay requisitos específicos para este documento.

Componentes Utilizados

Este documento no tiene restricciones específicas en cuanto a versiones de software y de hardware.

El EIGRP entre PE y CE en la función de entorno MPLS/VPN se introdujo en las versiones 12.0(22)S y 12.2(15)T del software Cisco IOS®.

Productos Relacionados

Esta configuración también se puede utilizar con estas series de routers:

- Cisco 7200
- 7500 de Cisco
- Cisco 10000
- 10700 de Cisco
- Cisco 12000
- Procesador de ruta de rendimiento (PRP) de Cisco serie 12000

Convenciones

Consulte [Convenciones de Consejos TécnicosCisco para obtener más información sobre las convenciones del documento.](#)

Antecedentes

Las rutas EIGRP se convierten a rutas BGP en la estructura básica del proveedor de servicios mediante nuevos atributos de comunidad ampliada específicos de EIGRP. El router de borde del proveedor (PE) utiliza BGP para distribuir la información de ruteo VPN mediante los atributos de comunidad ampliada específicos de EIGRP, que se agregan a la ruta BGP. Cuando alcanzan el router PE que está conectado al router de borde del cliente (CE) de destino, las rutas BGP vuelven a convertirse en rutas EIGRP por los atributos de comunidad ampliados específicos de EIGRP.

Esta tabla describe los atributos de comunidad extendida que se agregan a las rutas BGP y se utilizan para transportar información EIGRP a través de la estructura básica del proveedor de servicios.

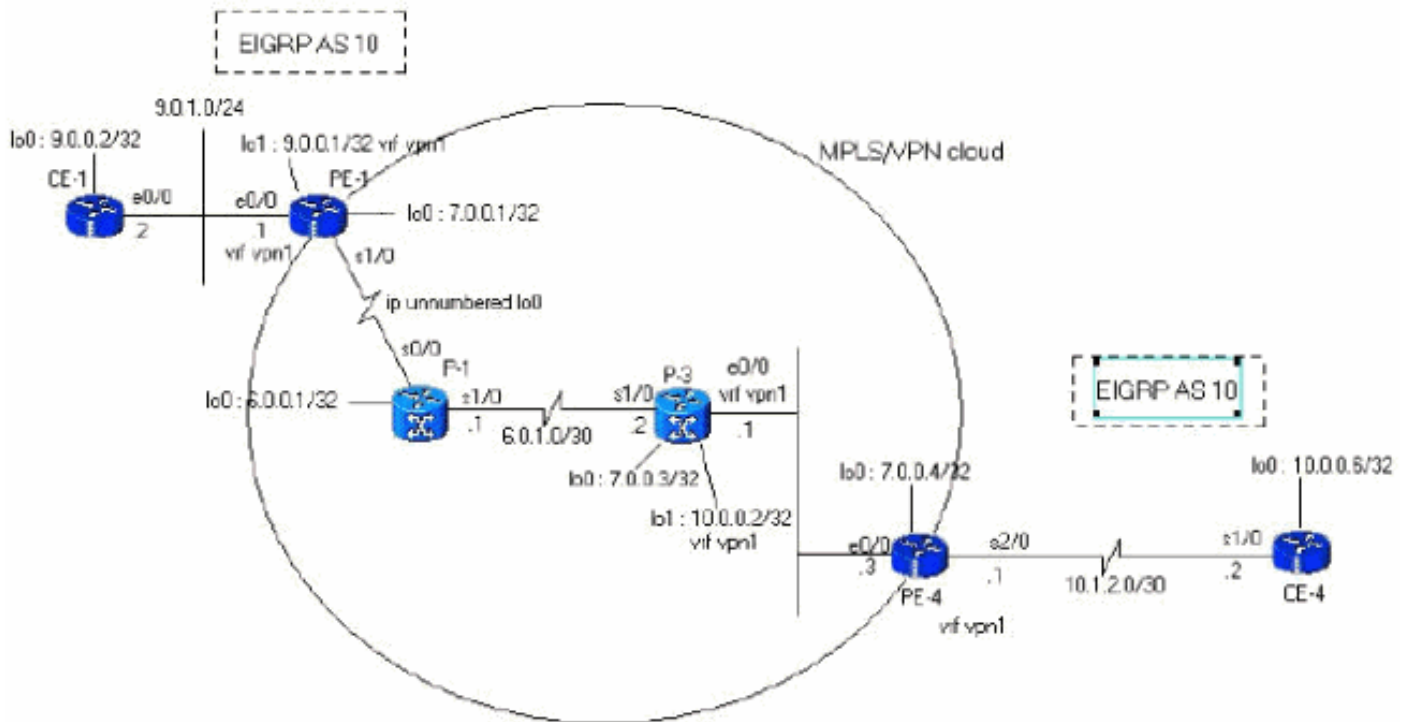| Atributo EIGRP	Tipo	Uso	Valor
General	0x8800	Información General de Ruta de EIGRP	Etiqueta e indicador de ruta
Métrico	0x8801	Información de Métrica de Ruta EIGRP y Sistema Autónomo	Sistema autónomo y retraso
	0x8802	Información de Métrica de Ruta EIGRP	Confiabilidad, salto siguiente y ancho de banda
	0x8803	Información de Métrica de Ruta EIGRP	Reserva, carga y unidad de transmisión máxima (MTU)
Externo	0x8804	Información de ruta externa EIGRP	Sistema autónomo remoto e ID remota
	0x8805	Información de ruta externa EIGRP	Protocolo remoto y métrica remota

Escenario 1: Configuración de un Sistema Autónomo EIGRP Único

En esta sección encontrará la información para configurar las funciones descritas en este documento.

Nota: Utilice la herramienta Command Lookup (sólo para clientes registrados) para obtener más información sobre los comandos utilizados en esta sección.

Diagrama de la red

Esta sección utiliza esta configuración de red:

Configuraciones

Esta sección usa estas configuraciones:

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
```

Verificación

Para verificar su configuración, utilice un enfoque paso a paso y verifique estos puntos en orden. Complete estos pasos:

1. Verifique que la instancia EIGRP esté configurada en la interfaz deseada—verifique el comando **vrf** y el comando **eigrp** network bajo la familia de direcciones correcta.En este ejemplo, el VRF se denomina 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 que la vecindad EIGRP esté establecida.En este ejemplo, puede ver que 9.0.1.2 (CE-1) es un vecino.

```
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 que la tabla de topología EIGRP contenga las subredes locales aprendidas mediante EIGRP (9.0.0.2/32).

En este ejemplo, puede ver que la tabla de topología EIGRP también contiene subredes aprendidas a través de la estructura básica MPLS/VPN (10.1.2.0/30).Las subredes se muestran como aprendidas a través de Redistributed (Redistribuido) y tiene una distancia reportada de 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. Si faltan subredes, verifique que estén en la tabla BGP con estos comandos **show** para un VRF específico.Si la redistribución entre BGP y EIRGP no está configurada correctamente, puede ver la subred en una tabla y no en la otra.

```
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
```

Los mismos comandos **show** se deben utilizar en el PE remoto.En este ejemplo, el PE remoto es 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
```

Resolución de problemas

En esta sección, se proporciona información sobre la consulta eigrp recibida por el PE y la actualización BGP correspondiente enviada a través de la nube MPLS/VPN. Esto se hace para la subred 10.0.0.6/32 conectada directamente al router CE-4 en la parte derecha del diagrama. Un 'shut' y 'no shut' realizados en la interfaz de loopback en CE-4 junto con el comando debug apropiado le ayuda a entender los tiggers.

Actualizar propagación en un sistema autónomo simple.

Estos comandos **debug** se utilizan para realizar el seguimiento de las actualizaciones de subred 10.0.0.6/32 (dirección de loopback de CE-4):

- debug eigrp fsm
- respuesta debug igrp packets requiere actualización
- debug ip eigrp 10 10.0.0.6 255.255.255.255
- debug ip bgp vpnv4
- debug ip bgp update

Este ejemplo muestra una entrada EIGRP retirada después de que se realice un comando **shut** en la interfaz loopback0 en 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 ejemplo muestra la creación de una entrada EIGRP después de que se realice un comando **no shut** en la interfaz loopback0 en 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
```
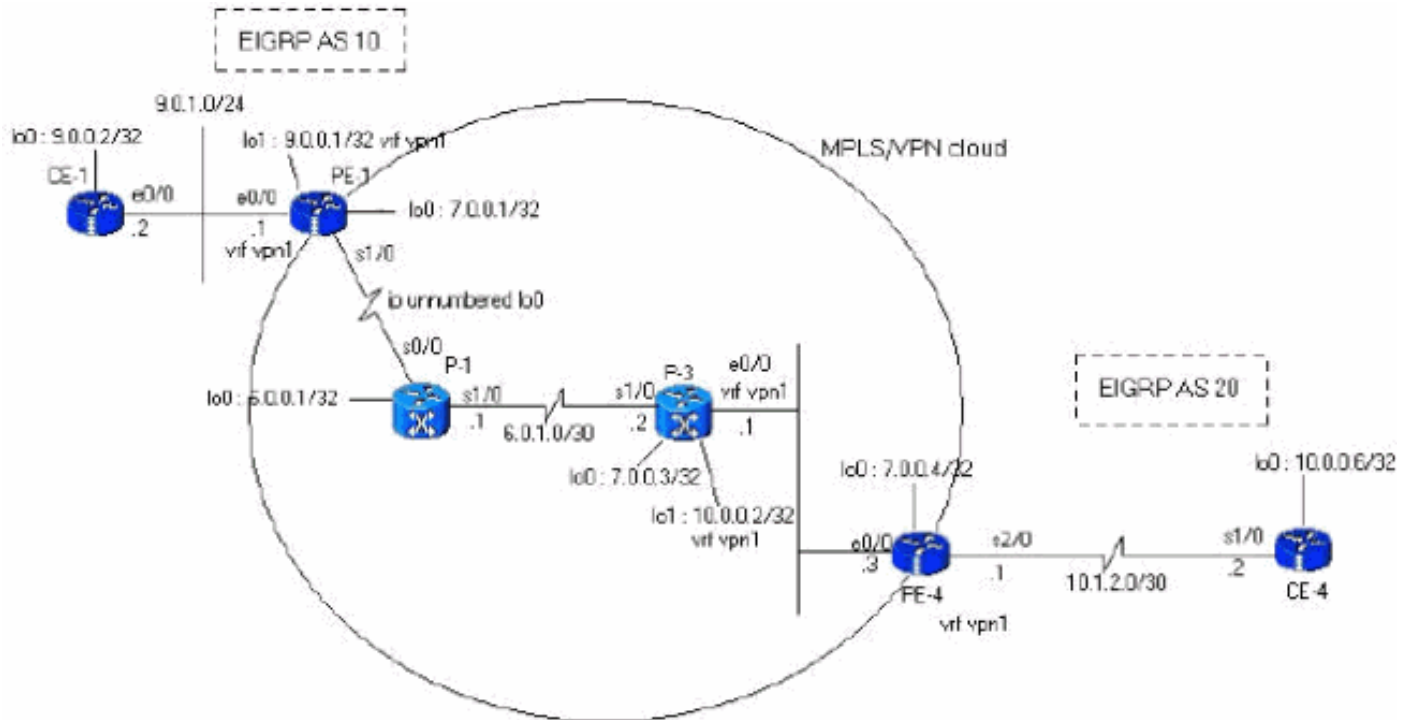
```
*Apr 30 08:28:17.737:   AS 10, Flags 0x0, Seq 13/0 idbQ 0/0 iidbQ un/rely
 0/0 serno 32-32
```

Escenario 2: Configuración de un Sistema Autónomo EIGRP Múltiple

Diagrama de la red

Esta sección utiliza esta configuración de red:

Configuraciones

Esta sección usa estas configuraciones:

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
```

Verificación

Utilice estos comandos para verificar su configuración:

- 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#
```

Información Relacionada

- Página de Soporte de EIGRP
- MPLS Support Page
- Soporte Técnico y Documentación - Cisco Systems