在客戶端上使用EIGRP的MPLS/VPN配置示例

目錄

簡介

本檔案將提供當客戶端存在EIGRP（增強型內部閘道路由通訊協定）時多重協定標籤交換(MPLS)虛擬私人網路(VPN)的範例組態。

本文檔提供了MPLS/VPN環境中客戶端EIGRP的配置示例。這些場景詳述：

- 屬於同一EIGRP自治系統的兩個連線端點(CE)。
- 屬於不同EIGRP自治系統的兩個CE。

對於這兩種情況，都會向您展示配置和驗證步驟。還提供了兩個相關協定(邊界網關協定(BGP)和EIGRP)的路由交換示例。

與MPLS一起使用時，VPN功能允許多個站點通過服務提供商網路透明地互連。一個服務提供商網路可以支援多個不同的IP VPN。其中每個網路對使用者而言都是一個私有網路，與其他網路分離。在VPN中，每個站點都可以向同一VPN中的任何其它站點傳送IP資料包。

每個VPN與一個或多個VPN路由/轉發例項(VRF)相關聯。VRF由IP路由表、派生的Cisco Express Forwarding(CEF)表以及使用此轉發表的一組介面組成。

路由器為每個VRF維護單獨的路由和CEF表。這可以防止資訊在VPN外部傳送，並允許在多個VPN中使用相同的子網，而不會導致重複的IP地址問題。

使用多重通訊協定BGP(MP-BGP)的路由器使用MP-BGP延伸群體分發VPN路由資訊。

有關通過VPN傳播更新的詳細資訊，請參閱以下文檔：

- MPLS虛擬私人網路組態
- MPLS VPN環境中的資料包流
- 使用OSPF配置基本MPLS

必要條件

需求

本文件沒有特定需求。

採用元件

本文件所述內容不限於特定軟體和硬體版本。

Cisco IOS®軟體版本12.0(22)S和12.2(15)T引入了MPLS/VPN環境中PE和CE之間的EIGRP功能。

相關產品

此配置也可以用於以下路由器系列：

- Cisco 7200
- Cisco 7500
- Cisco 10000
- Cisco 10700
- Cisco 12000
- 思科12000系列效能路由處理器(PRP)

慣例

如需文件慣例的詳細資訊，請參閱思科技術提示慣例。

背景資訊

EIGRP路由通過新的EIGRP特定擴展社群屬性在服務提供商骨幹上轉換為BGP路由。提供商邊緣(PE)路由器使用BGP，使用附加到BGP路由的EIGRP特定擴展社群屬性分發VPN路由資訊。當BGP路由到達連線到目標客戶邊緣(CE)路由器的PE路由器時，它們會通過EIGRP特定的擴展社群屬性轉換回EIGRP路由。

下表描述了附加到BGP路由並用於通過服務提供商骨幹傳輸EIGRP資訊的擴展社群屬性。

EIGRP屬性	類型	使用	價值
一般	0x8800	EIGRP常規路由資訊	路由標誌和標籤

指標	0x8801	EIGRP路由度量資訊和自治系統	自治系統和延遲
	0x8802	EIGRP路由度量資訊	可靠性、下一跳和頻寬
	0x8803	EIGRP路由度量資訊	預備、負載和最大傳輸單位(MTU)
外部	0x8804	EIGRP外部路由資訊	遠端自治系統和遠端ID
	0x8805	EIGRP外部路由資訊	遠端協定和遠端度量

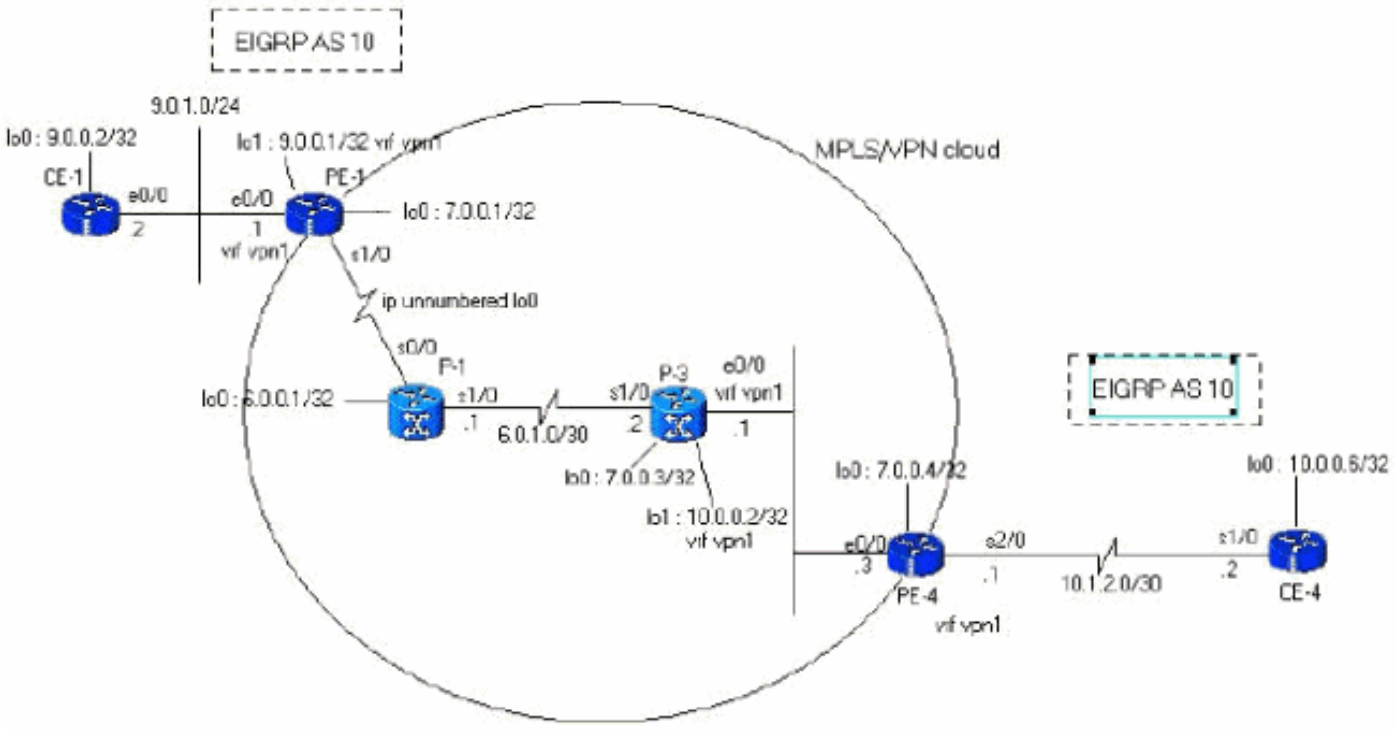
案例 1:配置單個EIGRP自治系統

本節提供用於設定本文件中所述功能的資訊。

註：使用Command Lookup Tool(僅供已註冊客戶使用)可獲取本節中使用的命令的詳細資訊。

網路圖表

本節使用以下網路設定：



組態

本節使用以下配置：

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
```

驗證

若要驗證您的組態，請使用逐步方法並按順序驗證這些點。請完成以下步驟：

1. 驗證在所需介面上配置了EIGRP例項 — 驗證**vrf**命令和**eigrp** network命令在正確的地址系列下。在本示例中，VRF稱為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. 檢驗EIGRP鄰居關係是否已建立。在本示例中，您可以看到9.0.1.2(CE-1)是鄰居。

```
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. 檢驗EIGRP拓撲表是否包含通過EIGRP(9.0.0.2/32)獲知的本地子網。

在此示例中，您可以看到EIGRP拓撲表還包含通過MPLS/VPN骨幹(10.1.2.0/30)獲知的子網。子網顯示為通過Redistributed獲取的，其報告距離為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. 如果缺少子網，請使用這些**show**命令檢驗它們是否在BGP表中。如果未正確配置BGP和EIRGP之間的重分發，則可能會在一個表中看到子網，而在另一個表中看不到子網。

```
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
```

遠端PE上必須使用相同的show命令。在本示例中，遠端PE為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
```

疑難排解

在本節中，提供了有關PE接收的eigrp查詢以及通過MPLS/VPN雲傳送的相應BGP更新的資訊。對於直接連線到圖右側的路由器CE-4的子網10.0.0.6/32，會執行此步驟。在CE-4的環回介面上執行「shut」和「no shut」以及相應的debug命令可幫助您瞭解觸發程式。

單個自治系統中的更新傳播

以下**debug**命令用於跟蹤子網10.0.0.6/32（CE-4的環回地址）更新：

- 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

此示例顯示在CE-4的loopback0介面上執行**shut**命令後撤銷的EIGRP條目：

```
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
```

此示例顯示了在CE-4的loopback0介面上執行no shut命令後建立EIGRP條目的過程：

```
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
```

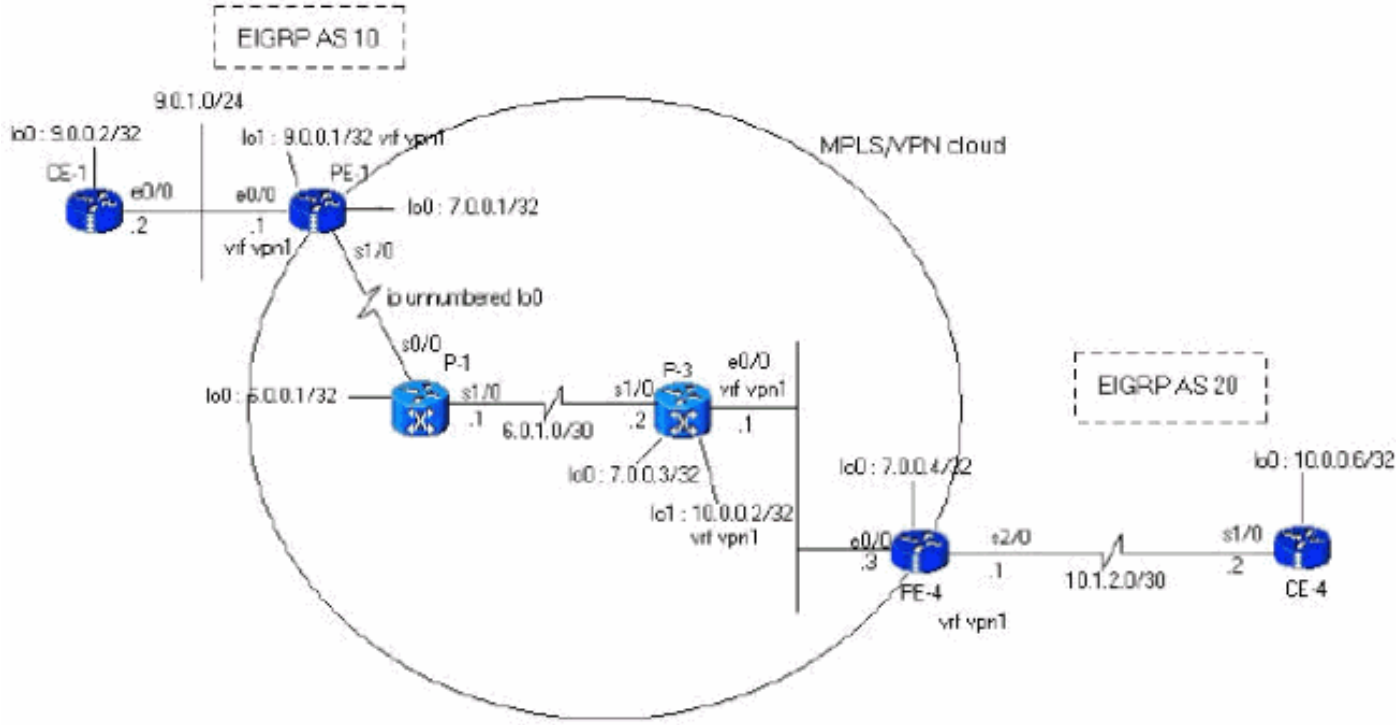
```
for 0ms, neighbor version 78, start version 78, throttled to 78
*Apr 30 08:39:07.053: BGP: Import walker start version 77, end version 78
*Apr 30 08:39:07.053: BGP: ... start import cfg version = 0
*Apr 30 08:39:07.053: vpn: vpn1 same RD import, do best path
*Apr 30 08:39:07.053: vpn: bgp allocate 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
```

案例 2:配置多個EIGRP自治系統

網路圖表

本節使用以下網路設定：



組態

本節使用以下配置：

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
```

驗證

使用以下命令驗證您的設定：

- show ip eigrp vrf vpn1介面
- show ip eigrp vrf vpn1 neighbors
- show ip eigrp vrf vpn1拓撲

```
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#
```

相關資訊

- EIGRP支援頁
- MPLS支援頁面
- 技術支援與文件 - Cisco Systems