MPLS/VPN with EIGRP on the Customer Side
Configuration Example

Document ID: 40883

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Introduction

This document provides a sample configuration of a Multiprotocol Label Switching (MPLS) Virtual Private
Network (VPN) when EIGRP (Enhanced Interior Gateway Routing Protocol) is present on the customer side.

This document provides a sample configuration for EIGRP at the customer side in an MPLS/VPN
environment. These scenarios are detailed:

  • Two connection endpoints (CEs) that belong to the same EIGRP autonomous systems.
  • Two CEs that belong to different EIGRP autonomous systems.

For both scenarios, you are presented with the configuration and verification steps. A sample of routing
exchange for both protocols involved Border Gateway Protocol (BGP) and EIGRP is also provided.

When used with MPLS, the VPN feature allows several sites to interconnect transparently through a service
provider network. One service provider network can support several different IP VPNs. Each of these appear
to its users as a private network, separate from all other networks. Within a VPN, each site can send IP
packets to any other site in the same VPN.

Each VPN is associated with one or more VPN routing/forwarding instances (VRFs). A VRF consists of an IP
routing table, a derived Cisco Express Forwarding (CEF) table, and a set of interfaces that use this forwarding
table.

The router maintains a separate routing and CEF table for each VRF. This prevents information being sent
outside the VPN and allows the same subnet to be used in several VPNs without causing duplicate IP address
problems.
The router that uses Multiprotocol BGP (MP–BGP) distributes the VPN routing information using the MP–BGP extended communities.

Refer to these documents for more information on the propagation of updates through a VPN:

- MPLS Virtual Private Networks Configuration
- Packet Flow in an MPLS VPN Environment
- Configuring Basic MPLS Using OSPF

### Prerequisites

### Requirements

There are no specific requirements for this document.

### Components Used

This document is not restricted to specific software and hardware versions.

The EIGRP between PE and CE in MPLS/VPN environment feature was introduced in Cisco IOS® Software Releases 12.0(22)S and 12.2(15)T.

### Related Products

This configuration can also be used with these router series:

- Cisco 7200
- Cisco 7500
- Cisco 10000
- Cisco 10700
- Cisco 12000
- Cisco 12000 series Performance Route Processor (PRP)

### Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

### Background Information

EIGRP routes are converted to BGP routes on the service provider backbone by new EIGRP–specific extended community attributes. The provider edge (PE) router uses BGP to distribute the VPN routing information using the EIGRP–specific extended community attributes, which are appended to the BGP route. The BGP routes are converted back to EIGRP routes by the EIGRP–specific extended community attributes when they reach the PE router that is connected to the destination customer edge (CE) router.

This table describes the extended community attributes that are appended to BGP routes and used to carry EIGRP information across the service provider backbone.

<table>
<thead>
<tr>
<th>EIGRP Attribute</th>
<th>Type</th>
<th>Usage</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>0x8800</td>
<td>Route Flag and Tag</td>
<td></td>
</tr>
</tbody>
</table>
### EIGRP General Route Information

<table>
<thead>
<tr>
<th>Metric</th>
<th>EIGRP Route Metric Information and Autonomous System</th>
<th>Autonomous System and Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x8801</td>
<td>EIGRP Route Metric Information</td>
<td>Reliability, Next Hop, and Bandwidth</td>
</tr>
<tr>
<td>0x8802</td>
<td>EIGRP Route Metric Information</td>
<td>Reserve, Load and Maximum Transmission Unit (MTU)</td>
</tr>
<tr>
<td>0x8803</td>
<td>EIGRP Route Metric Information</td>
<td>Remote Protocol and Remote Metric</td>
</tr>
</tbody>
</table>

### Scenario 1: Configure a Single EIGRP Autonomous System

In this section, you are presented with the information to configure the features described in this document.

**Note:** Use the Command Lookup Tool (registered customers only) to obtain more information on the commands used in this section.

### Network Diagram

This section uses this network setup:
## Configurations

This section uses these configurations:

<table>
<thead>
<tr>
<th>PE-1</th>
</tr>
</thead>
</table>
| **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.  
routetarget export 100:1  

!--- Creates lists of import and export route-target extended  

!--- communities for the specified VRF.  
routetarget 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
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
  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

Verify

In order to verify your configuration, use a step-by-step approach and verify these points in order. Complete
these steps:

1. Verify that the EIGRP instance is configured on the desired interface verify the vrf command and the eigrp network command under the correct address-family.

   In this example, the VRF is called 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. Verify that the EIGRP neighborship is established.

   In this example, you can see that 9.0.1.2 (CE-1) is a neighbor.

   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. Verify that the EIGRP topology table contains the local subnets learned via EIGRP (9.0.0.2/32).

   In this example, you can see that the EIGRP topology table also contains subnets learned across the MPLS/VPN backbone (10.1.2.0/30).

   The subnets are shown as learned via Redistributed and has a reported distance of 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 Connected, Loopback1
   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. If subnets are missing, verify that they are in the BGP table with these show commands for one specific VRF.

   If the redistribution between BGP and EIRGP is not configured correctly, you might see the subnet in one table and not in the other.
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           4586776         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

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

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

The same show commands must be used on the remote PE.

In this example, the remote PE is PE-4:

show ip eigrp vrf vpn1 interfaces
IP-EIGRP interfaces for process 10
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

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

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
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

<table>
<thead>
<tr>
<th>Network</th>
<th>Next Hop</th>
<th>Metric</th>
<th>LocPrf</th>
<th>Weight</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0.0.1/32</td>
<td>7.0.0.1</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>9.0.0.2/32</td>
<td>7.0.0.1</td>
<td>409600</td>
<td>100</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>9.0.1.0/24</td>
<td>7.0.0.1</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>9.1.0.2/32</td>
<td>7.0.0.1</td>
<td>4586776</td>
<td>100</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>10.0.0.6/32</td>
<td>10.1.2.2</td>
<td>2297856</td>
<td>32768</td>
<td></td>
<td>?</td>
</tr>
<tr>
<td>10.1.2.0/30</td>
<td>0.0.0.0</td>
<td>0</td>
<td>0</td>
<td>32768</td>
<td>?</td>
</tr>
<tr>
<td>10.1.3.0/24</td>
<td>10.1.2.2</td>
<td>2195456</td>
<td>32768</td>
<td></td>
<td>?</td>
</tr>
<tr>
<td>13.0.0.1/32</td>
<td>0.0.0.0</td>
<td>0</td>
<td>32768</td>
<td></td>
<td>i</td>
</tr>
</tbody>
</table>

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#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
Troubleshooting

In this section, information about the eigrp query received by the PE and the corresponding BGP update sent through the MPLS/VPN cloud is provided. This is done for the subnet 10.0.0.6/32 directly connected to the router CE−4 at the right hand of the diagram. A 'shut' and 'no shut' performed on the loopback interface on CE−4 together with the appropriate debug command helps you to understand the triggers.

Update Propagation in a Single Autonomous System

These debug commands are used to track subnet 10.0.0.6/32 (loopback address of CE−4) updates:

- `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`

This example shows an EIGRP entry withdrawn after a shut command is performed on the loopback0 interface on 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 08:36:59.913: vpn: bgp_router, vpn ipv4 redirect len = 1  
*Apr 30 08:36:59.913: BGP(2): route 100:1:10.0.0.6/32 down  
*Apr 30 08:36:59.913: BGP(2): no valid path for 100:1:10.0.0.6/32  
*Apr 30 08:36:59.913: 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 redirect 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
This example shows the creation of an EIGRP entry after a no shut command is performed on the loopback0 interface on CE-4:
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 08:38:53.745: vpn: bgp_route, 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: 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 08:39:07.053: BGP: Import walker start version 77, end version 78

*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: 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 08:35:36.409: BGP: 7.0.0.3 multihop open delayed 15100ms (no route)

*Apr 30 08:35:37.981: BGP: 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 08:39:09.413: BGP(2): 7.0.0.1 computing updates, afi 2, neighbor version 77, table version 78, starting at 0.0.0.0

*Apr 30 08:39:07.305: 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 compute 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

PE-1

*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 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

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*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 computing updates, afi 2, neighbor version 78, table version 79, starting at 0.0.0.0

*Apr 30 08:35:39.081: BGP: 7.0.0.2 multihop open delayed 16412ms (no route)

*Apr 30 08:35:39.081: BGP: 7.0.0.2 multihop open delayed 16412ms (no route)
Scenario 2: Configure a Multiple EIGRP Autonomous System

Network Diagram

This section uses this network setup:
Configurations

This section uses these configurations:

```plaintext
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#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

Verify

Use these commands to verify your configuration:

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

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)
<table>
<thead>
<tr>
<th>Route</th>
<th>Next Hop</th>
<th>Metric</th>
<th>LocPrf</th>
<th>Weight</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0.0.1/32</td>
<td>0.0.0.0</td>
<td>0</td>
<td>32768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0.0.2/32</td>
<td>9.0.1.2</td>
<td>409600</td>
<td>32768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0.1.0/24</td>
<td>0.0.0.0</td>
<td>0</td>
<td>32768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1.0.2/32</td>
<td>9.0.1.2</td>
<td>4586776</td>
<td>32768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0.0.6/32</td>
<td>7.0.0.4</td>
<td>2297856</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10.0.0.7/32</td>
<td>7.0.0.4</td>
<td>2323456</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10.1.2.0/30</td>
<td>7.0.0.4</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10.1.3.0/24</td>
<td>7.0.0.4</td>
<td>2195456</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>13.0.0.1/32</td>
<td>7.0.0.4</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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# 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)
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:
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

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 9.0.0.2/32 is directly connected, Loopback1
C 9.0.0.3/32 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)

Related Information

- EIGRP Support Page
- MPLS Support Page
- Technical Support & Documentation – Cisco Systems