



# Configuring IPv6 VPN Provider Edge over MPLS (6VPE)

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## Configuring 6VPE

### Information About 6VPE

6VPE is a mechanism to use the IPv4 backbone to provide VPN IPv6 services. It takes advantage of operational IPv4 MPLS backbones, eliminating the need for dual-stacking within the MPLS core. This translates to savings in operational costs and addresses the security limitations of the 6PE approach. 6VPE is more like a regular IPv4 MPLS-VPN provider edge, with an addition of IPv6 support within VRF. It provides logically separate routing table entries for VPN member devices.

#### Components of MPLS-based 6VPE Network

- VPN route target communities – A list of all other members of a VPN community.
- Multiprotocol BGP (MP-BGP) peering of VPN community PE routers – Propagates VRF reachability information to all members of a VPN community.
- MPLS forwarding – Transports all traffic between all VPN community members across a VPN service-provider network.

In the MPLS-VPN model a VPN is defined as a collection of sites sharing a common routing table. A customer site is connected to the service provider network by one or more interfaces, where the service provider associates each interface with a VPN routing table—known as the VRF table.

For scale information related to this feature, see [Cisco Catalyst 9400 Series Switch Data Sheet](#).

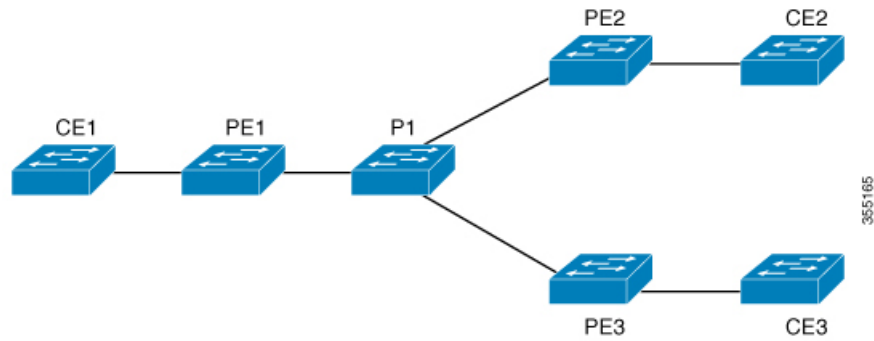
### Restrictions for 6VPE

- Inter-AS and carrier supporting carrier (CSC) is not supported.
- VRF Route-Leaking is not supported.
- eBGP as CE-PE is not supported.

- EIGRP, OSPFv3, RIP, ISIS, Static Routes are supported as CE-PE.
- MPLS Label Allocation modes supported are Per-VRF and Per-Prefix. Per-Prefix is the default mode.
- IP fragmentation is not supported in the Per-Prefix mode of Layer 3 VPN.

## Configuration Examples for 6VPE

Figure 1: 6VPE Topology



PE Configuration	CE Configuration
	<pre>interface TenGigabitEthernet1/0/38 no switchport ip address 10.3.1.2 255.255.255.0 ip ospf 2 area 0 ipv6 address 10:111:111:111::2/64 ipv6 enable ipv6 ospf 1 area 0 ! router ospfv3 1 nsr graceful-restart address-family ipv6 unicast !</pre>

PE Configuration	CE Configuration
<pre> vrf definition 6VPE-1  rd 65001:11   route-target export 1:1   route-target import 1:1  !  address-family ipv4   exit-address-family  !  address-family ipv6   exit-address-family  ! interface TenGigabitEthernet1/0/38  no switchport  vrf forwarding 6VPE-1  ip address 10.3.1.1 255.255.255.0  ip ospf 2 area 0  ipv6 address 10:111:111:111::1/64  ipv6 enable  ospfv3 1 ipv6 area 0  ! router ospf 2 vrf 6VPE-1  router-id 1.1.11.11  redistribute bgp 65001 subnets  ! router ospfv3 1  nsr  graceful-restart  ! address-family ipv6 unicast vrf 6VPE-1  redistribute bgp 65001  exit-address-family  ! router bgp 65001  bgp router-id interface Loopback1  bgp log-neighbor-changes  bgp graceful-restart  neighbor 33.33.33.33 remote-as 65001  neighbor 33.33.33.33 update-source Loopback1  !  address-family ipv4 vrf 6VPE-1   redistribute ospf 2 match internal external  1 external 2  exit-address-family  address-family ipv6 vrf 6VPE-1   redistribute ospf 1 match internal external  1 external 2 include-connected  exit-address-family  ! address-family vpnv4  neighbor 33.33.33.33 activate  neighbor 33.33.33.33 send-community both  neighbor 44.44.44.44 activate  neighbor 44.44.44.44 send-community both  neighbor 55.55.55.55 activate  neighbor 55.55.55.55 send-community both  exit-address-family  ! address-family vpnv6  neighbor 33.33.33.33 activate  neighbor 33.33.33.33 send-community both  neighbor 44.44.44.44 activate </pre>	

PE Configuration	CE Configuration
<pre>neighbor 44.44.44.44 send-community both neighbor 55.55.55.55 activate neighbor 55.55.55.55 send-community both exit-address-family !</pre>	

The following is a sample output of **show mpls forwarding-table vrf** :

```
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
29 No Label A:A:A:565::/64[V] \ 0 aggregate/VRF601
32 No Label A:B5:1:5::/64[V] 2474160 V1601 FE80::200:7BFF:FE62:2636
33 No Label A:B5:1:4::/64[V] 2477978 V1601 FE80::200:7BFF:FE62:2636
35 No Label A:B5:1:3::/64[V] 2477442 V1601 FE80::200:7BFF:FE62:2636
36 No Label A:B5:1:2::/64[V] 2476906 V1601 FE80::200:7BFF:FE62:2636
37 No Label A:B5:1:1::/64[V] 2476370 V1601 FE80::200:7BFF:FE62:2636
```

The following is a sample output of **show vrf counter** command :

```
Maximum number of VRFs supported: 256
Maximum number of IPv4 VRFs supported: 256
Maximum number of IPv6 VRFs supported: 256
Maximum number of platform iVRFs supported: 10
Current number of VRFs: 127
Current number of IPv4 VRFs: 6
Current number of IPv6 VRFs: 127
Current number of VRFs in delete state: 0
Current number of platform iVRFs: 1
```

The following is a sample output of **show ipv6 route vrf** command :

```
IPv6 Routing Table - VRF1 - 8 entries Codes: C - Connected, L - Local, S
- Static, U - Per-user Static route B - BGP, R - RIP, I1 - ISIS L1, I2
- ISIS L2 IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP
external ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr -
Redirect RL - RPL, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1 OE2
- OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2 la - LISP
alt, lr - LISP site-registrations, ld - LISP dyn-eid la - LISP away

B 1:1:1:1::1/128 [200/1] via 1.1.1.11%default, indirectly connected
O 2:2:2:2::2/128 [110/1] via FE80::A2E0:AFFF:FE30:3E40,
TenGigabitEthernet1/0/7
B 3:3:3:3::3/128 [200/1] via 3.3.3.33%default, indirectly connected
B 10:1:1:1::/64 [200/0] via 1.1.1.11%default, indirectly connected
C 10:2:2:2::/64 [0/0] via TenGigabitEthernet1/0/7, directly connected
L 10:2:2:2:1/128 [0/0] via TenGigabitEthernet1/0/7, receive
B 10:3:3:3::/64 [200/0] via 3.3.3.33%default, indirectly connected
L FF00::/8 [0/0] via Null0, receive
```

## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <https://cfng.cisco.com/>. An account on Cisco.com is not required.