Configuring MPLS VPN InterAS Options

Information About MPLS VPN InterAS Options

The MPLS VPN InterAS Options provide various ways of interconnecting VPNs between different MPLS VPN service providers. This allows sites of a customer to exist on several carrier networks (autonomous systems) and have seamless VPN connectivity between these sites.

ASes and ASBRs

An autonomous system (AS) is a single network or group of networks that is controlled by a common system administration group and using a single, clearly defined protocol. In many cases, VPNs extend to different ASes in different geographical areas. Some VPNs must extend across multiple service providers; these VPNs are called overlapping VPNs. The connection between ASes must be seamless to the customer, regardless of the complexity or location of the VPNs.

An AS boundary router (ASBR) is a device in an AS that is connected by using more than one routing protocol, and exchanges routing information with other ASBRs by using an exterior routing protocol (for example, eBGP), or use static routes, or both.

Separate ASes from different service providers communicate by exchanging information in the form of VPN IP addresses and they use the following protocols to share routing information:

- Within an AS, routing information is shared using iBGP.

  iBGP distributes network layer information for IP prefixes within each VPN and each AS.

- Between ASes, routing information is shared using eBGP.

  eBGP allows service providers to set up an interdomain routing system that guarantees loop-free exchange of routing information between separate ASes. The primary function of eBGP is to exchange network reachability information between ASes, including information about the list of AS routes. The ASes use

eBGP border edge routers to distribute the routes, which includes label-switching information. Each border edge router rewrites the next-hop and MPLS labels.

MPLS VPN InterAS Options configuration is supported and can include an inter provider VPN, which is MPLS VPNs that include two or more ASes, connected by separate border edge routers. The ASes exchange routes using eBGP, and no iBGP or routing information is exchanged between the ASes.

MPLS VPN InterAS Options

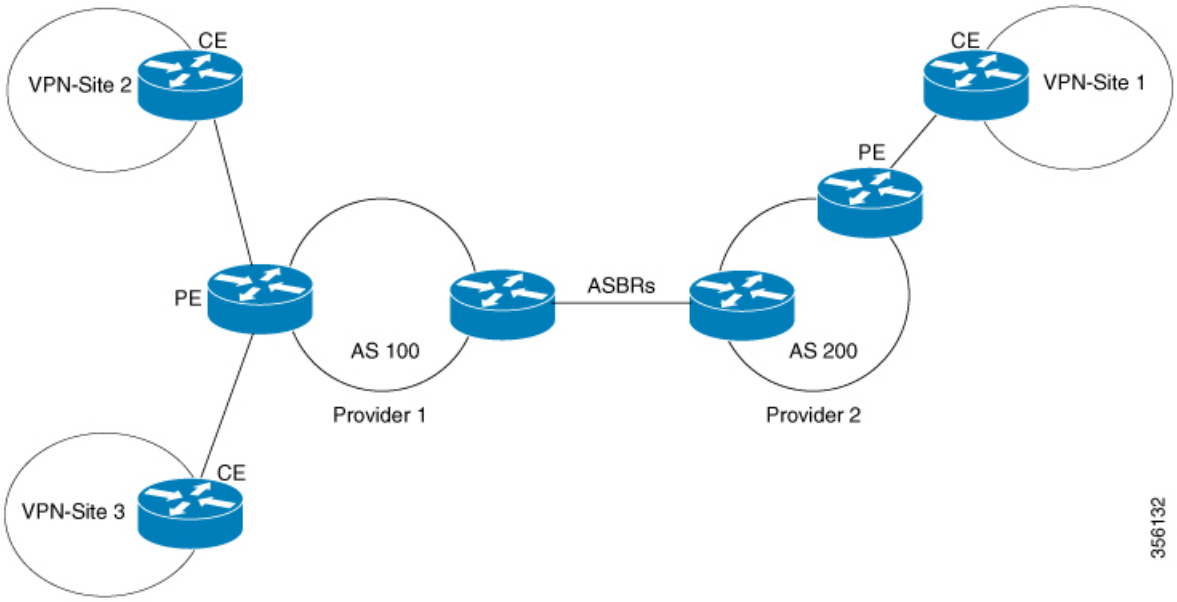
The following options defined in RFC4364 provide MPLS VPN connectivity between different ASes:

- InterAS Option B – This option provides VPNv4 route distribution between ASBRs.

InterAS Option B

In an interAS option B network, ASBR ports are connected by one or more interfaces that are enabled to receive MPLS traffic. With this option, the ASBRs peer with each other using eBGP session. The ASBR also functions as a PE router and peers with every PE router in their AS. The ASBR does not hold any VRFs but holds all or a subset of VPNv4 routes from PE router that need to be passed to the other AS. VPNv4 routes are kept unique in ASBR using route-distinguisher and are filtered using route targets. The ASBRs exchange VPNv4 routes and VPN labels using eBGP.

Figure 1: Topology for InterAS Option B



Two methods are supported to distribute the next hop for VPNv4 routes between ASBRs. There is no requirement for LDP or any IGP to be enabled on the link connecting the two ASBRs. The MP-eBGP session between directly connected interfaces on the ASBRs enables the interfaces to forward labeled packets. To ensure this MPLS forwarding for directly connected BGP peers, you must configure mpls bgp forwarding command on the interface connecting to ASBR. This command is implemented in the IOS for directly connected interfaces. Upto 200 BGP neighbors can be configured.

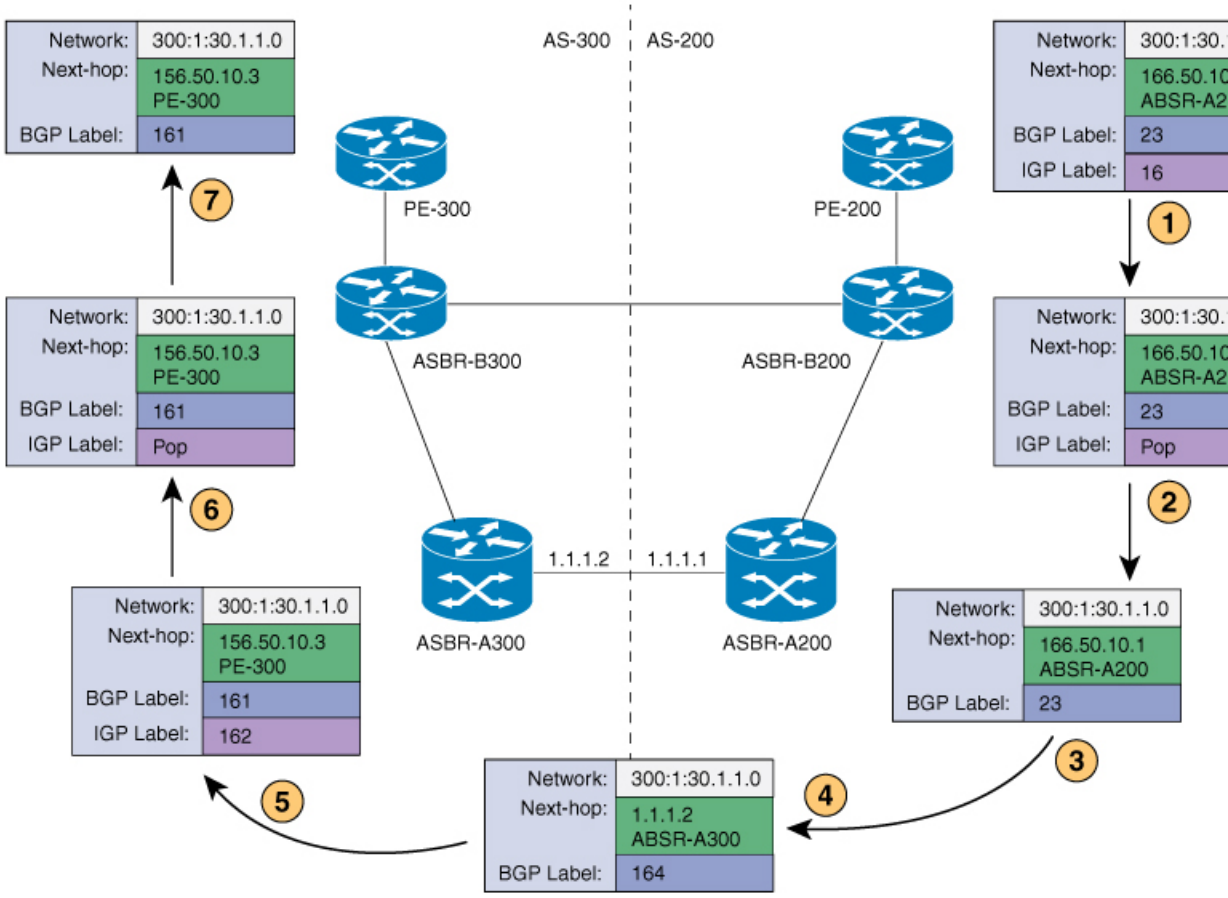
- **Next-hop-self Method:** Changing next-hop to that of the local ASBR for all VPNv4 routes learnt from the other ASBR.
- **Redistribute Connected Subnets Method:** Redistributing the next hop address of the remote ASBR into the local IGP using redistribute connected subnets command , i.e., the next hop is not changed when the VPNv4 routes are redistributed into the local AS.

Note In case of multiple equal paths - ECMP towards remote AS, you have to configure MPLS static label bindings towards remote Loopback on ASBR. Otherwise, you may experience packet loss.

The label switch path forwarding sections described below has AS200 configured with the Next-hop-self method and the AS300 is configured with Redistribute-subnet method.

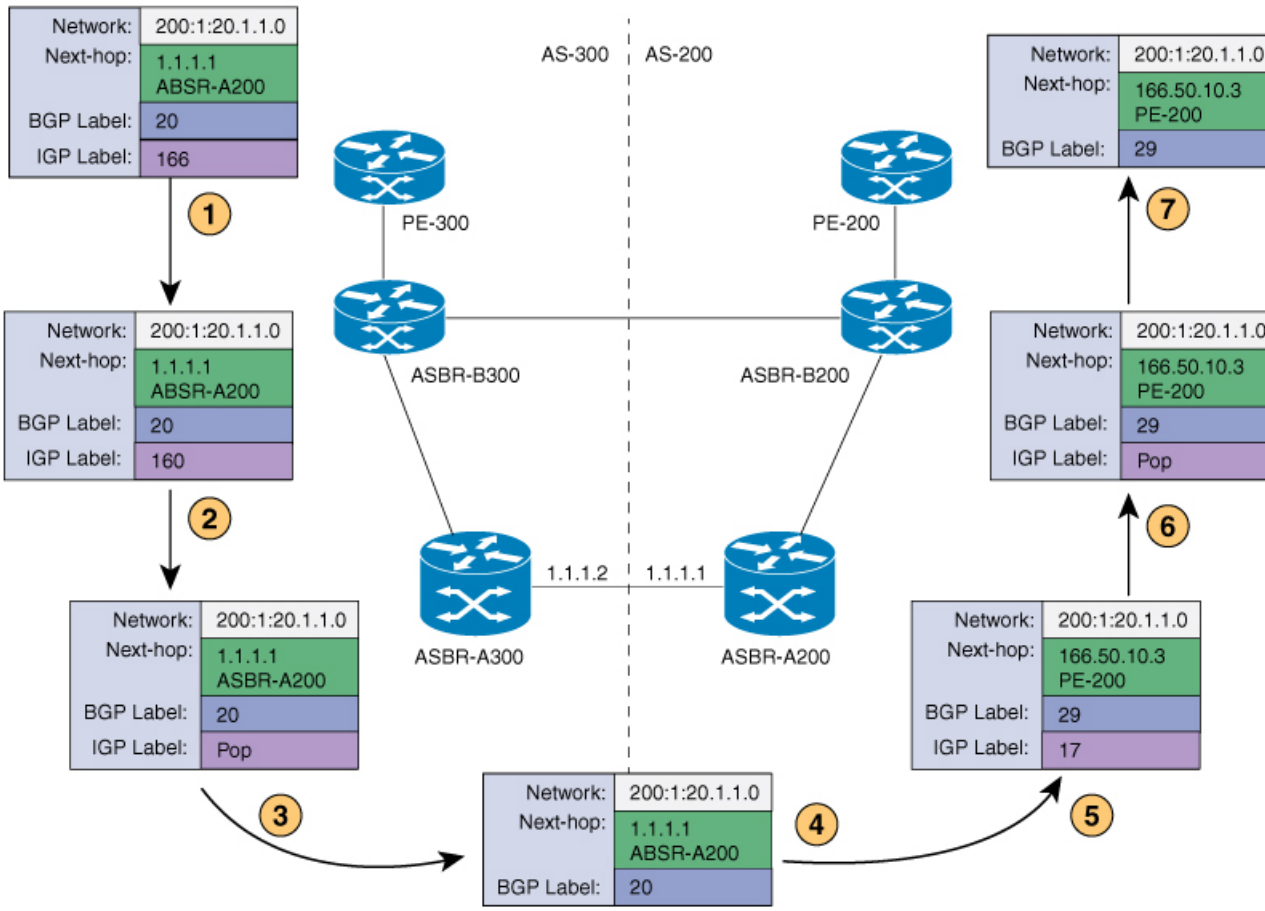
Next-Hop Self Method

The following figure shows the label forwarding path for next-hop-self method. The labels get pushed, swapped and popped on the stack as packet makes its way from PE-200 in AS 200 to PE-300 in AS 300. In step 5, ASBR-A300 receives labeled frame, replaces label 164 with label 161 pushes IGP label 162 onto the label stack.



Redistribute Connected Subnet Method

The following figure shows the label forwarding path for Redistribute connected subnets method. The labels get pushed, swapped and popped on the stack as packet travels from PE- 300 in AS 300 to PE-200 in AS 200. In step 5, ASBR-A200 receives frame with BGP label 20, swaps it with label 29 and pushes label 17.



How to Configure MPLS VPN InterAS Options

The following section provides information about how to configure MPLS VPN InterAS Options.

Configuring MPLS VPN InterAS Option B

Configuring InterAS Option B using the Next-Hop-Self Method

To configure interAS Option B on ASBRs using the next-hop-self method, complete the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router ospf** *process-id* **Example:** `Device(config)# router ospf 1`	Configures an OSPF routing process and assign a process number.
Step 4	**router-id** *ip-address* **Example:** `Device(config)# router-id 4.1.1.1`	Specifies a fixed router ID.
Step 5	**nsr** **Example:** `Device(config-router)# nsr`	Configures OSPF non-stop routing (NSR).
Step 6	**nsf** **Example:** `Device(config-router)# nsf`	Confgures OSPF non-stop forwarding (NSF).
Step 7	**redistribute bgp** *autonomous-system-number* **Example:** `Device(config-router)# redistribute bgp 200`	Redistributes routes from a BGP autonomous system into and OSPF routing process.

Step 8	**passive-interface** *interface-type interface-number*
	Example:
	`Device(config-router)# passive-interface GigabitEthernet 1/0/10`
	`Device(config-router)# passive-interface Tunnel0`
		Disables Open Shortest Path First (OSPF) routing updates on an interface.

	Command or Action	Purpose
Step 9	**network** *ip-address wildcard-mask* **aread** *area-id* **Example:** `Device(config-router)# network 4.1.1.0 0.0.0.255 area 0`	Defines an interface on which OSPF runs and defines the area ID for that interface.
Step 10	**exit** **Example:** `Device(config-router)# exit`	Exits router configuration mode.
Step 11	**router bgp** *autonomous-system-number* **Example:** `Device(config)# router bgp 200`	Configures a BGP routing process.
Step 12	**bgp router-id** *ip-address* **Example:** `Device(config-router)# bgp router-id 4.1.1.1`	Configures a fixed router ID for the BGP routing process.
Step 13	**bgp log-neighbor changes** **Example:** `Device(config-router)# bgp log-neighbor changes`	Enables logging of BGP neighbor resets.
Step 14	**no bgp default ipv4-unicast** **Example:** `Device(config-router)# no bgp default ipv4-unicast`	Disables advertisement of routing information for address family IPv4.
Step 15	**no bgp default route-target filter** **Example:** `Device(config-router)# no bgp default route-target filter`	Disables automatic BGP route-target community filtering.
Step 16	**neighbor** *ip-address* **remote-as** *as-number* **Example:** `Device(config-router)# neighbor 4.1.1.3 remote-as 200`	Configures an entry to the BGP neighbor table.

	Command or Action	Purpose
Step 17	**neighbor** *ip-address* **update-source** *interface-type interface-number* **Example:** `Device(config-router)# neighbor 4.1.1.3 update-source Loopback0`	Allows Cisco IOS software to use a specific operational interface for TCP connections by the BGP sessions.
Step 18	**neighbor** *ip-address* **remote-as** *as-number* **Example:** `Device(config-router)# neighbor 4.1.1.3 remote-as 300`	Configures an entry to the BGP neighbor table.
Step 19	**address-family** *ipv4* **Example:** `Device(config-router)# address-family ipv4`	Enters address family configuration mode for configuring BGP routing sessions that use standard IP Version 4 address prefixes.
Step 20	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 10.32.1.2 activate`	Enables the exchange of information with a BGP neighbor.
Step 21	**neighbor** *ip-address* **send-label** **Example:** `Device(config-router-af)# neighbor 10.32.1.2 send-label`	Sends MPLS labels with BGP routes to a neighboring BGP router.
Step 22	**exit address-family** **Example:** `Device(config-router-af)# exit address-family`	Exits BGP address-family submode.
Step 23	**address-family** *vpnv4* **Example:** `Device(config-router)# address-family vpnv4`	Configures the device in address family configuration mode for configuring routing sessions, such as BGP, that use standard VPNv4 address prefixes.
Step 24	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 4.1.1.3 activate`	Enables the exchange of information with a BGP neighbor.

	Command or Action	Purpose
Step 25	**neighbor** *ip-address* **send-community extended** **Example:** `Device(config-router-af)# neighbor 4.1.1.3 send-community extended`	Specifies that a communities attribute should be sent to a BGP neighbor.
Step 26	**neighbor** *ip-address* **next-hop-self** **Example:** `Device(config-router-af)# neighbor 4.1.1.3 next-hop-self`	Configure a router as the next hop for a BGP-speaking neighbor. This is the command that implements the next-hop-self method.
Step 27	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 10.30.1.2 activate`	Enables the exchange of information with a BGP neighbor.
Step 28	**neighbor** *ip-address* **send-community extended** **Example:** `Device(config-router-af)# neighbor 10.30.1.2 send-community extended`	Specifies that a communities attribute should be sent to a BGP neighbor.
Step 29	**exit address-family** **Example:** `Device(config-router-af)# exit address-family`	Exits BGP address-family submode.
Step 30	**bgp router-id** *ip-address* **Example:** `Device(config-router)# bgp router-id 4.1.1.3`	Configures a fixed router ID for the BGP routing process.
Step 31	**bgp log-neighbor changes** **Example:** `Device(config-router)# bgp log-neighbor changes`	Enables logging of BGP neighbor resets.
Step 32	**neighbor** *ip-address* **remote-as** *as-number* **Example:** `Device(config-router)# neighbor 4.1.1.1 remote-as 200`	Configures an entry to the BGP neighbor table.

	Command or Action	Purpose
Step 33	**neighbor** *ip-address* **update-source** *interface-type interface-number* **Example:** `Device(config-router)# neighbor 4.1.1.1 update-source Loopback0`	Allows Cisco IOS software to use a specific operational interface for TCP connections by the BGP sessions.
Step 34	**address-family** *vpnv4* **Example:** `Device(config-router)# address-family vpnv4`	Configures the device in address family configuration mode for configuring routing sessions, such as BGP, that use standard VPNv4 address prefixes.
Step 35	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 4.1.1.1 activate`	Enables the exchange of information with a BGP neighbor.
Step 36	**neighbor** *ip-address* **send-community extended** **Example:** `Device(config-router-af)# neighbor 4.1.1.1 send-community extended`	Specifies that a communities attribute should be sent to a BGP neighbor.
Step 37	**exit address-family** **Example:** `Device(config-router-af)# exit address-family`	Exits BGP address-family submode.

Configuring InterAS Option B using Redistribute Connected Method

To configure interAS Option B on ASBRs using the redistribute connected method, complete the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Device# configure terminal`	
Step 3	**router ospf** *process-id* **Example:** `Device(config)# router ospf 1`	Configures an OSPF routing process and assign a process number.
Step 4	**router-id** *ip-address* **Example:** `Device(config)# router-id 5.1.1.1`	Specifies a fixed router ID.
Step 5	**nsr** **Example:** `Device(config-router)# nsr`	Configures OSPF non-stop routing (NSR).
Step 6	**nsf** **Example:** `Device(config-router)# nsf`	Confgures OSPF non-stop forwarding (NSF).
Step 7	**redistribute connected** **Example:** `Device(config-router)# redistribute connected`	Redistributes the next hop address of the remote ASBR into the local IGP. This is the command that implements redistribute connected method.

Step 8	**passive-interface** *interface-type interface-number*
	Example:
	`Device(config-router)# passive-interface GigabitEthernet 1/0/10`
	`Device(config-router)# passive-interface Tunnel0`
		Disables Open Shortest Path First (OSPF) routing updates on an interface.

Step 9	**network** *ip-address wildcard-mask* **aread** *area-id* **Example:** `Device(config-router)# network 5.1.1.0 0.0.0.255 area 0`	Defines an interface on which OSPF runs and defines the area ID for that interface.
Step 10	**exit** **Example:** `Device(config-router)# exit`	Exits router configuration mode.

	Command or Action	Purpose
Step 11	**router bgp** *autonomous-system-number* **Example:** `Device(config)# router bgp 300`	Configures a BGP routing process.
Step 12	**bgp router-id** *ip-address* **Example:** `Device(config-router)# bgp router-id 5.1.1.1`	Configures a fixed router ID for the BGP routing process.
Step 13	**bgp log-neighbor changes** **Example:** `Device(config-router)# bgp log-neighbor changes`	Enables logging of BGP neighbor resets.
Step 14	**no bgp default ipv4-unicast** **Example:** `Device(config-router)# no bgp default ipv4-unicast`	Disables advertisement of routing information for address family IPv4.
Step 15	**no bgp default route-target filter** **Example:** `Device(config-router)# no bgp default route-target filter`	Disables automatic BGP route-target community filtering.
Step 16	**neighbor** *ip-address* **remote-as** *as-number* **Example:** `Device(config-router)# neighbor 5.1.1.3 remote-as 300`	Configures an entry to the BGP neighbor table.
Step 17	**neighbor** *ip-address* **update-source** *interface-type interface-number* **Example:** `Device(config-router)# neighbor 4.1.1.3 update-source Loopback0`	Allows Cisco IOS software to use a specific operational interface for TCP connections by the BGP sessions.
Step 18	**neighbor** *ip-address* **remote-as** *as-number* **Example:** `Device(config-router)# neighbor 10.30.1.2 remote-as 200`	Configures an entry to the BGP neighbor table.

	Command or Action	Purpose
Step 19	**address-family** *vpnv4* **Example:** `Device(config-router)# address-family vpnv4`	Configures the device in address family configuration mode for configuring routing sessions, such as BGP, that use standard VPNv4 address prefixes.
Step 20	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 5.1.1.3 activate`	Enables the exchange of information with a BGP neighbor.
Step 21	**neighbor** *ip-address* **send-community extended** **Example:** `Device(config-router-af)# neighbor 5.1.1.3 send-community extended`	Specifies that a communities attribute should be sent to a BGP neighbor.
Step 22	**neighbor** *ip-address* **activate** **Example:** `Device(config-router-af)# neighbor 10.30.1.1 activate`	Enables the exchange of information with a BGP neighbor.
Step 23	**neighbor** *ip-address* **send-community extended** **Example:** `Device(config-router-af)# neighbor 10.30.1.2 send-community extended`	Specifies that a communities attribute should be sent to a BGP neighbor.
Step 24	**exit address-family** **Example:** `Device(config-router-af)# exit address-family`	Exits BGP address-family submode.
Step 25	**mpls ldp router-id** *interface-id* [**force**] **Example:** `Device(config-router)# mpls ldp router-id Loopback0 force`	Specifies the preferred interface for determining the LDP router ID.

Verifying MPLS VPN InterAS Options Configuration

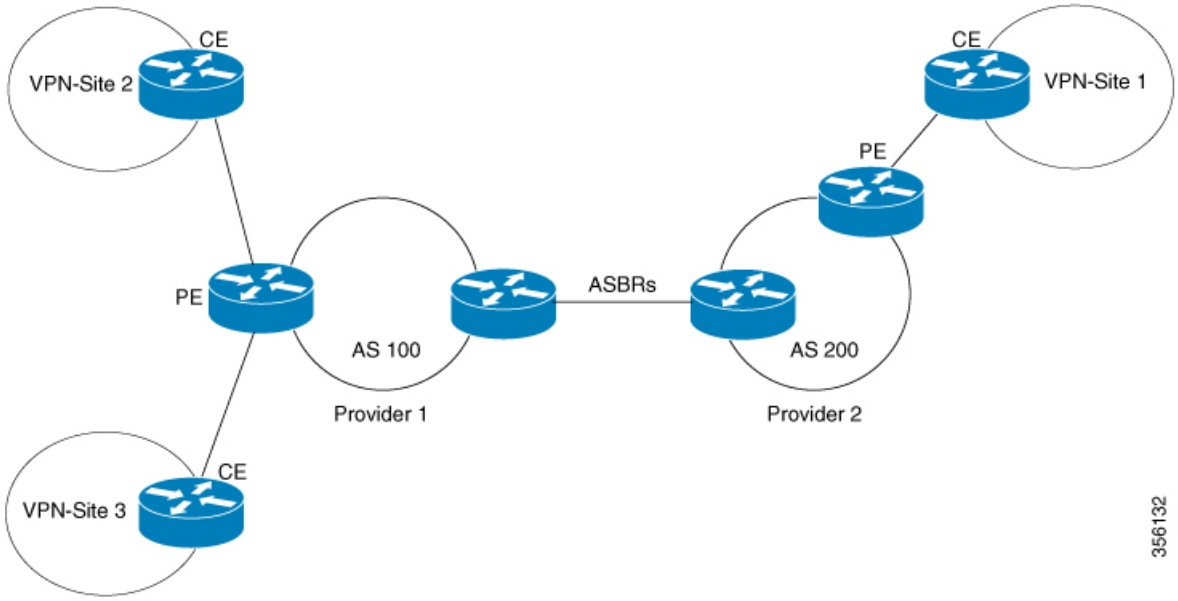
To verify InterAS option B configuration information, perform one of the following tasks:

Command	Purpose
ping *ip-address* **source** *interface-type*	Checks the accessibility of devices. Use this command to check the connection between CE1 and CE2 using the loopback interface.
show bgp vpnv4 unicast labels	Displays incoming and outgoing BGP labels.
show mpls forwarding-table	Display the contents of the MPLS Label Forwarding Information Base.
show ip bgp	Displays entries in the BGP routing table.
show { **ip** | **ipv6** } **bgp** [**vrf** *vrf-name*]	Displays information about BGP on a VRF.
show ip route [*ip-address* [*mask*]] [*protocol*] **vrf** *vrf-name*	Displays the current state of the routing table. Use the ip-address argument to verify that CE1 has a route to CE2. Verify the routes learned by CE1. Make sure that the route for CE2 is listed.
show { **ip** | **ipv6** } **route vrf** *vrf-name*	Displays the IP routing table that is associated with a VRF. Check that the loopback addresses of the local and remote CE routers are in the routing table of the PE routers.
show running-config bgp	Displays the running configuration for BGP.
show running-config vrf *vrf-name*	Displays the running configuration for VRFs.
show vrf *vrf-name* **interface** *interface-type interface-id*	Verifies the route distinguisher (RD) and interface that are configured for the VRF.
trace destination [**vrf** *vrf-name*]	Discovers the routes that packets take when traveling to their destination. The **trace** command can help isolate a problem if two routers cannot communicate.

Configuration Examples for MPLS VPN InterAS Options

Next-Hop-Self Method

Figure 2: Topology for InterAS Option B using Next-Hop-Self Method



Configuration for PE1-P1-ASBR1

PE1	P1	ASBR1
	interface Loopback0 ip address 4.1.1.2 255.255.255.255 ip ospf 1 area 0 interface GigabitEthernet1/0/4 no switchport ip address 10.10.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp ! interface GigabitEthernet1/0/23 no switchport ip address 10.20.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp	interface Loopback0 ip address 4.1.1.1 255.255.255.255 ip ospf 1 area 0 interface GigabitEthernet1/0/10 no switchport ip address 10.30.1.1 255.255.255.0 mpls bgp forwarding interface GigabitEthernet1/0/23 no switchport ip address 10.20.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp router ospf 1 router-id 4.1.1.1 nsr nsf redistribute bgp 200 passive-interface GigabitEthernet1/0/10 passive-interface Tunnel0 network 4.1.1.0 0.0.0.255 area 0 router bgp 200 bgp router-id 4.1.1.1 bgp log-neighbor-changes no bgp default ipv4-unicast no bgp default route-target filter neighbor 4.1.1.3 remote-as 200 neighbor 4.1.1.3 update-source Loopback0 neighbor 10.30.1.2 remote-as 300 ! address-family ipv4 neighbor 10.30.1.2 activate neighbor 10.30.1.2 send-label exit-address-family ! address-family vpnv4 neighbor 4.1.1.3 activate neighbor 4.1.1.3 send-community extended neighbor 4.1.1.3 next-hop-self neighbor 10.30.1.2 activate neighbor 10.30.1.2 send-community extended exit-address-family

PE1	P1	ASBR1
vrf definition Mgmt-vrf ! address-family ipv4 exit-address-family ! address-family ipv6 exit-address-family ! vrf definition vrf1 rd 200:1 route-target export 200:1 route-target import 200:1 route-target import 300:1 ! address-family ipv4 exit-address-family interface Loopback0 ip address 4.1.1.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 vrf forwarding vrf1 ip address 192.1.1.1 255.255.255.255 ip ospf 200 area 0 ! interface GigabitEthernet2/0/4 no switchport ip address 10.10.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp interface GigabitEthernet2/0/9 description to-IXIA-1:p8 no switchport vrf forwarding vrf1 ip address 192.2.1.1 255.255.255.0 ip ospf 200 area 0 router ospf 200 vrf vrf1 router-id 192.1.1.1 nsr nsf redistribute connected redistribute bgp 200 network 192.1.1.1 0.0.0.0 area 0 network 192.2.1.0 0.0.0.255 area 0 router ospf 1 router-id 4.1.1.3 nsr nsf redistribute connected router bgp 200 bgp router-id 4.1.1.3 bgp log-neighbor-changes neighbor 4.1.1.1 remote-as 200 neighbor 4.1.1.1 update-source Loopback0		

PE1	P1	ASBR1
! address-family vpnv4 neighbor 4.1.1.1 activate neighbor 4.1.1.1 send-community extended exit-address-family ! address-family ipv4 vrf vrf1 redistribute connected redistribute ospf 200 maximum-paths ibgp 2 exit-address-family		

Configuration for ASBR2 – P2 – PE2

Table 1:

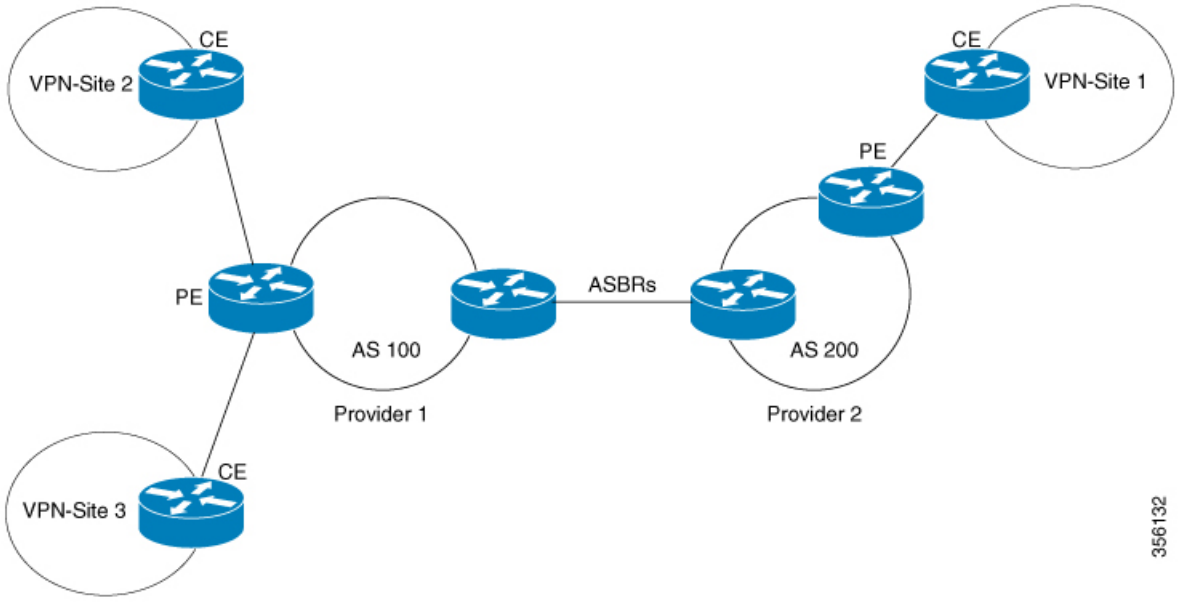
PE2	P2	ASBR2
	interface Loopback0 ip address 5.1.1.2 255.255.255.255 ip ospf 1 area 0 interface GigabitEthernet1/0/1 no switchport ip address 10.50.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp interface GigabitEthernet2/0/3 no switchport ip address 10.40.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp	interface Loopback0 ip address 5.1.1.1 255.255.255.255 ip ospf 1 area 0 ! interface GigabitEthernet1/0/37 no switchport ip address 10.30.1.2 255.255.255.0 mpls bgp forwarding interface GigabitEthernet1/0/47 no switchport ip address 10.40.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp router ospf 1 router-id 5.1.1.1 nsr nsf passive-interface GigabitEthernet1/0/37 passive-interface Tunnel0 network 5.1.1.0 0.0.0.255 area 0 ! router bgp 300 bgp router-id 5.1.1.1 bgp log-neighbor-changes no bgp default ipv4-unicast no bgp default route-target filter neighbor 5.1.1.3 remote-as 300 neighbor 5.1.1.3 update-source Loopback0 neighbor 10.30.1.1 remote-as 200 ! address-family ipv4 neighbor 10.30.1.1 activate neighbor 10.30.1.1 send-label exit-address-family ! address-family vpnv4 neighbor 5.1.1.3 activate neighbor 5.1.1.3 send-community extended neighbor 5.1.1.3 next-hop-self neighbor 10.30.1.1 activate neighbor 10.30.1.1 send-community extended exit-address-family

PE2	P2	ASBR2
vrf definition vrf1 rd 300:1 route-target export 300:1 route-target import 300:1 route-target import 200:1 ! address-family ipv4 exit-address-family interface Loopback0 ip address 5.1.1.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 vrf forwarding vrf1 ip address 193.1.1.1 255.255.255.255 ip ospf 300 area 0 interface GigabitEthernet1/0/1 no switchport ip address 10.50.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp ! interface GigabitEthernet1/0/2 no switchport vrf forwarding vrf1 ip address 193.2.1.1 255.255.255.0 ip ospf 300 area 0 router ospf 300 vrf vrf1 router-id 193.1.1.1 nsr nsf redistribute connected redistribute bgp 300 network 193.1.1.1 0.0.0.0 area 0 network 193.2.1.0 0.0.0.255 area 0 ! router ospf 1 router-id 5.1.1.3 nsr nsf redistribute connected router bgp 300 bgp router-id 5.1.1.3 bgp log-neighbor-changes neighbor 5.1.1.1 remote-as 300 neighbor 5.1.1.1 update-source Loopback0 ! address-family ipv4 neighbor 5.1.1.1 activate neighbor 5.1.1.1 send-label exit-address-family ! address-family vpnv4 neighbor 5.1.1.1 activate		

PE2	P2	ASBR2
neighbor 5.1.1.1 send-community extended exit-address-family ! address-family ipv4 vrf vrf1 redistribute connected redistribute ospf 300 maximum-paths ibgp 2 exit-address-family		

IGP Redistribute Connected Subnets Method

Figure 3: Topology for InterAS Option B using Redistribute Connected Subnets Method



Configuration for PE1-P1-ASBR1

PE1	P1	ASBR1
	interface Loopback0 ip address 4.1.1.2 255.255.255.255 ip ospf 1 area 0 interface GigabitEthernet1/0/4 no switchport ip address 10.10.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp ! interface GigabitEthernet1/0/23 no switchport ip address 10.20.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp	router ospf 1 router-id 4.1.1.1 nsr nsf redistribute connected passive-interface GigabitEthernet1/0/10 passive-interface Tunnel0 network 4.1.1.0 0.0.0.255 area 0 router bgp 200 bgp router-id 4.1.1.1 bgp log-neighbor-changes no bgp default ipv4-unicast no bgp default route-target filter neighbor 4.1.1.3 remote-as 200 neighbor 4.1.1.3 update-source Loopback0 neighbor 10.30.1.2 remote-as 300 ! address-family vpnv4 neighbor 4.1.1.3 activate neighbor 4.1.1.3 send-community extended neighbor 10.30.1.2 activate neighbor 10.30.1.2 send-community extended exit-address-family mpls ldp router-id Loopback0 force

PE1	P1	ASBR1
vrf definition Mgmt-vrf ! address-family ipv4 exit-address-family ! address-family ipv6 exit-address-family ! vrf definition vrf1 rd 200:1 route-target export 200:1 route-target import 200:1 route-target import 300:1 ! address-family ipv4 exit-address-family interface Loopback0 ip address 4.1.1.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 vrf forwarding vrf1 ip address 192.1.1.1 255.255.255.255 ip ospf 200 area 0 ! interface GigabitEthernet2/0/4 no switchport ip address 10.10.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp interface GigabitEthernet2/0/9 description to-IXIA-1:p8 no switchport vrf forwarding vrf1 ip address 192.2.1.1 255.255.255.0 ip ospf 200 area 0 router ospf 200 vrf vrf1 router-id 192.1.1.1 nsr nsf redistribute connected redistribute bgp 200 network 192.1.1.1 0.0.0.0 area 0 network 192.2.1.0 0.0.0.255 area 0 router ospf 1 router-id 4.1.1.3 nsr nsf redistribute connected router bgp 200 bgp router-id 4.1.1.3 bgp log-neighbor-changes neighbor 4.1.1.1 remote-as 200 neighbor 4.1.1.1 update-source Loopback0		

PE1	P1	ASBR1
! address-family vpnv4 neighbor 4.1.1.1 activate neighbor 4.1.1.1 send-community extended exit-address-family ! address-family ipv4 vrf vrf1 redistribute connected redistribute ospf 200 maximum-paths ibgp 2 exit-address-family		

Configuration for ASBR2 – P2 – PE2

PE2	P2	ASBR2
	interface Loopback0 ip address 5.1.1.2 255.255.255.255 ip ospf 1 area 0 interface GigabitEthernet1/0/1 no switchport ip address 10.50.1.1 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp interface GigabitEthernet2/0/3 no switchport ip address 10.40.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp	router ospf 1 router-id 5.1.1.1 nsr nsf redistribute connected passive-interface GigabitEthernet1/0/10 passive-interface Tunnel0 network 5.1.1.0 0.0.0.255 area 0 router bgp 300 bgp router-id 5.1.1.1 bgp log-neighbor-changes no bgp default ipv4-unicast no bgp default route-target filter neighbor 5.1.1.3 remote-as 300 neighbor 5.1.1.3 update-source Loopback0 neighbor 10.30.1.1 remote-as 200 ! address-family vpnv4 neighbor 5.1.1.3 activate neighbor 5.1.1.3 send-community extended neighbor 10.30.1.1 activate neighbor 10.30.1.1 send-community extended exit-address-family mpls ldp router-id Loopback0 force

PE2	P2	ASBR2
vrf definition vrf1 rd 300:1 route-target export 300:1 route-target import 300:1 route-target import 200:1 ! address-family ipv4 exit-address-family interface Loopback0 ip address 5.1.1.3 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 vrf forwarding vrf1 ip address 193.1.1.1 255.255.255.255 ip ospf 300 area 0 interface GigabitEthernet1/0/1 no switchport ip address 10.50.1.2 255.255.255.0 ip ospf 1 area 0 mpls ip mpls label protocol ldp ! interface GigabitEthernet1/0/2 no switchport vrf forwarding vrf1 ip address 193.2.1.1 255.255.255.0 ip ospf 300 area 0 router ospf 300 vrf vrf1 router-id 193.1.1.1 nsr nsf redistribute connected redistribute bgp 300 network 193.1.1.1 0.0.0.0 area 0 network 193.2.1.0 0.0.0.255 area 0 ! router ospf 1 router-id 5.1.1.3 nsr nsf redistribute connected router bgp 300 bgp router-id 5.1.1.3 bgp log-neighbor-changes neighbor 5.1.1.1 remote-as 300 neighbor 5.1.1.1 update-source Loopback0 ! address-family ipv4 neighbor 5.1.1.1 activate neighbor 5.1.1.1 send-label exit-address-family ! address-family vpnv4 neighbor 5.1.1.1 activate		

PE2	P2	ASBR2
neighbor 5.1.1.1 send-community extended exit-address-family ! address-family ipv4 vrf vrf1 redistribute connected redistribute ospf 300 maximum-paths ibgp 2 exit-address-family		

Additional References for MPLS VPN InterAS Options

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	See the MPLS Commands section of the*Command Reference (Catalyst 9300 Series Switches)*

Feature History for MPLS VPN InterAS Options

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

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Release	Feature	Feature Information
Cisco IOS XE Gibraltar 16.11.1	MPLS VPN InterAS Option B	InterAS Options use iBGP and eBGP peering to allow VPNs in different AS to communicate with each other. In an interAS option B network, ASBR ports are connected by one or more interfaces that are enabled to receive MPLS traffic.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.