



Configuring eIBGP Multipath

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BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

The BGP Multipath Load Sharing for eBGP and iBGP feature allows you to configure multipath load balancing with both external BGP (eBGP) and internal BGP (iBGP) paths in Border Gateway Protocol (BGP) networks that are configured to use Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs). This feature provides improved load balancing deployment and service offering capabilities and is useful for multi-homed autonomous systems and Provider Edge (PE) routers that import both eBGP and iBGP paths from multihomed and stub networks.

Prerequisites for BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

Cisco Express Forwarding (CEF) or distributed CEF (dCEF) must be enabled on all participating devices.

Restrictions for BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

Address Family Support

This feature is configured on a per VPN routing and forwarding instance (VRF) basis. This feature can be configured under both IPv4 and IPv6 VRF address families.

Memory Consumption Restriction

Each BGP multipath routing table entry will use additional memory. We recommend that you do not use this feature on a device with a low amount of available memory and especially if the device carries full Internet routing tables.

Number of Paths Limitation

The number of paths supported are limited to 2 BGP multipaths. This could either be 2 iBGP multipaths or 1 iBGP multipath and 1 eBGP multipath.

VPNv4 Limitation

Catalyst 3850 Series Switches do not support eBGP as Provider Edge (PE) and Customer Edge (CE) routing protocol for VPN Version 4. Use Enhanced Interior Gateway Routing Protocol (EIGRP), Interior Gateway Protocol (IGP), Open Shortest Path First (OSPF) or Routing Information Protocol (RIP).

Unsupported Commands

`ip unnumbered` command is not supported in MPLS configuration.

Information About BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

Multipath Load Sharing Between eBGP and iBGP

A BGP routing process will install a single path as the best path in the routing information base (RIB) by default. The `maximum-paths` command allows you to configure BGP to install multiple paths in the RIB for multipath load sharing. BGP uses the best path algorithm to select a single multipath as the best path and advertise the best path to BGP peers.



Note

The number of paths of multipaths that can be configured is documented on the `maximum-paths` command reference page.

Load balancing over the multipaths is performed by CEF. CEF load balancing is configured on a per-packet round robin or on a per session (source and destination pair) basis. For information about CEF, refer to Cisco IOS IP Switching Configuration Guide documentation: http://ciscosystems.com/en/US/docs/ios/ipswitch/configuration/guide/12_2sx/isw_12_2sx_book.html.The

BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN feature is enabled under the IPv4 VRF address family and IPv6 VRF address family configuration modes. When enabled, this feature can perform load balancing on eBGP and/or iBGP paths that are imported into the VRF. The number of multipaths is configured on a per VRF basis. Separate VRF multipath configurations are isolated by unique route distinguisher.

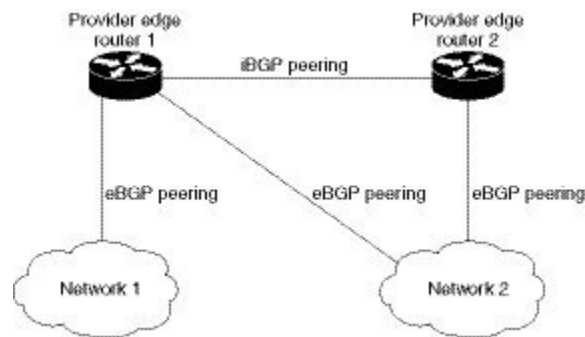


Note The BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN feature operates within the parameters of configured outbound routing policy.

eBGP and iBGP Multipath Load Sharing in a BGP MPLS Network

The following figure shows a service provider BGP MPLS network that connects two remote networks to PE router 1 and PE router 2. PE router 1 and PE router 2 are both configured for VPNv4 unicast iBGP peering. Network 2 is a multihomed network that is connected to PE router 1 and PE router 2. Network 2 also has extranet VPN services configured with Network 1. Both Network 1 and Network 2 are configured for eBGP peering with the PE routers.

Figure 1: Service Provider BGP MPLS Network



PE router 1 can be configured with the BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN feature so that both iBGP and eBGP paths can be selected as multipaths and imported into the VRF. The multipaths will be used by CEF to perform load balancing. IP traffic that is sent from Network 1 to Network 2, PE router 1 will Load Sharing with eBGP paths as IP traffic & iBGP path will be sent as MPLS traffic.



Note

- eBGP session between local CE & local PE is not supported.
- eBGP session from a local PE to a remote CE is supported.

Benefits of Multipath Load Sharing for Both eBGP and iBGP

The BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN feature allows multihomed autonomous systems and PE routers to be configured to distribute traffic across both eBGP and iBGP paths.

How to Configure BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

This section contains the following procedures:

Configuring Multipath Load Sharing for Both eBGP and iBGP

SUMMARY STEPS

1. `enable`
2. `configure { terminal | memory | network }`
3. `router bgp as-number`
4. `address-family ipv4 vrfvrf-name`
5. `address-family ipv6 vrfvrf-name`
6. `maximum-paths eibgp number [import number]`

DETAILED STEPS

| | Command or Action | Purpose |
|--------|--|--|
| Step 1 | <code>enable</code> Example: Device> <code>enable</code> | Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted. |
| Step 2 | <code>configure { terminal memory network }</code> Example: Device# <code>configure terminal</code> | Enters global configuration mode. |
| Step 3 | <code>router bgp as-number</code> Example: Device(config)# <code>router bgp 40000</code> | Enters router configuration mode to create or configure a BGP routing process. |
| Step 4 | <code>address-family ipv4 vrfvrf-name</code> Example: Device(config-router)# <code>address-family ipv4 vrf RED</code> | Places the router in address family configuration mode. <ul style="list-style-type: none">• • Separate VRF multipath configurations are isolated by unique route distinguisher. |
| Step 5 | <code>address-family ipv6 vrfvrf-name</code> Example: Device(config-router)# <code>address-family ipv6 vrf RED</code> | Places the router in address family configuration mode. <ul style="list-style-type: none">• • Separate VRF multipath configurations are isolated by unique route distinguisher. |
| Step 6 | <code>maximum-paths eibgp number [import number]</code> Example: | Configures the number of parallel iBGP and eBGP routes that can be installed into a routing table. |

| | Command or Action | Purpose |
|--|--|---|
| | Device (config-router-af) # <code>maximum-paths eibgp 2</code> | Note The <code>maximum-paths eibgp</code> command can be configured only under the IPv4 VRF address family configuration mode and cannot be configured in any other address family configuration mode. |

Verifying Multipath Load Sharing for Both eBGP and iBGP

SUMMARY STEPS

1. `enable`
2. `show ip bgp neighbors`
3. `show ip bgp vpnv4 vrfvrf name`
4. `show ip route vrfvrf-name`

DETAILED STEPS

| | Command or Action | Purpose |
|---------------|---|--|
| Step 1 | <code>enable</code> Example: Device> <code>enable</code> | Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted. |
| Step 2 | <code>show ip bgp neighbors</code> Example: Device# <code>show ip bgp neighbors</code> | Displays information about the TCP and BGP connections to neighbors. |
| Step 3 | <code>show ip bgp vpnv4 vrfvrf name</code> Example: Device# <code>show ip bgp vpnv4 vrf RED</code> | Displays VPN address information from the BGP table. This command is used to verify that the VRF has been received by BGP. |
| Step 4 | <code>show ip route vrfvrf-name</code> Example: Device# <code>show ip route vrf RED</code> | Displays the IP routing table associated with a VRF instance. The <code>show ip route vrf</code> command is used to verify that the VRF is in the routing table. |

Example

What to do next

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Configuration Examples for the BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN Feature

The following examples show how to configure and verify this feature:

eBGP and iBGP Multipath Load Sharing Configuration Example

This following configuration example configures a router in IPv4 address-family mode to select two BGP routes (eBGP or iBGP) as multipaths:

```
Device router bgp 40000
  Deviceaddress-family ipv4 vrf RED
Devicemaximum-paths eibgp 2
Deviceend
```

This following configuration example configures a router in IPv6 address-family mode to select two BGP routes (eBGP or iBGP) as multipaths:

```
Device router bgp 40000
  Deviceaddress-family ipv6 vrf RED
Devicemaximum-paths eibgp 2
Deviceend
```

Additional References

Related Documents

Table 1: Related Documents

| Related Topic | Document Title |
|--|---|
| BGP commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples | • Cisco IOS IP Command Reference, Volume 2 of 4: Routing Protocols, Release 12.3T |
| BGP configuration tasks | • Cisco IOS IP Configuration Guide, Release 12.3 |
| Comprehensive BGP link bandwidth configuration examples and tasks | • BGP Link Bandwidth |
| CEF configuration tasks | • Cisco IOS Switching Services Configuration Guide |

Table 2: Standards

| Standard | Title |
|--|-------|
| No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature | -- |

Table 3: RFCs

| RFC | Title |
|----------|------------------------------------|
| RFC 1771 | A Border Gateway Protocol 4 (BGP4) |
| RFC 2547 | BGP/MPLS VPNs |
| RFC 2858 | Multiprotocol Extensions for BGP-4 |

Table 4: Technical Assistance

| Description | Link |
|---|---|
| Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content. | http://www.cisco.com/public/support/tac/home.shtml |

Feature Information for BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 5: Feature Information for BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN

| Feature Name | Releases | Feature Information |
|--|------------------|---|
| BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN | Cisco IOS 16.6.1 | The BGP Multipath Load Sharing for eBGP and iBGP feature allows you to configure multipath load balancing with both external BGP (eBGP) and internal BGP (iBGP) paths in Border Gateway Protocol (BGP) networks that are configured to use Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs). This feature provides improved load balancing deployment and service offering capabilities and is useful for multi-homed autonomous systems and Provider Edge (PE) routers that import both eBGP and iBGP paths from multihomed and stub networks. |