



## Configuring eBGP and iBGP 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.

### 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.



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

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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: [IP Switching Cisco Express Forwarding Configuration Guide](#). 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.

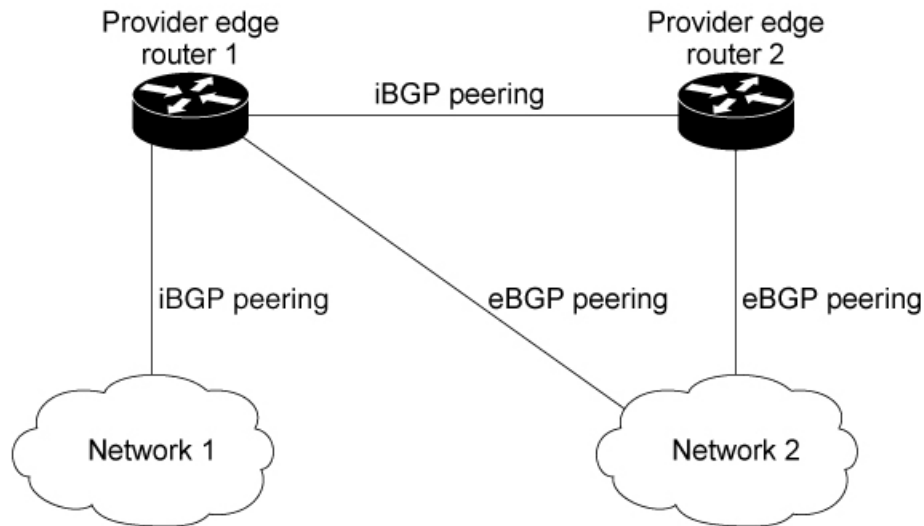


**Note** The BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN feature operates within the parameters of configured outbound routing policy.

## 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 Share 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.
  - eiBGP Multipath is supported in per prefix label allocation mode only. It is not supported in other label allocation modes.

## 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. **neighbor** { *ip-address* | *ipv6-address* | *peer-group-name* }
5. **address-family ipv4 vrfvrf-name**
6. **address-family ipv6 vrfvrf-name**
7. **neighbor** { *ip-address* | *ipv6-address* | *peer-group-name* } **update-source** *interface-type interface-name*
8. **neighbor** { *ip-address* | *ipv6-address* | *peer-group-name* } **activate**
9. **maximum-paths eibgp number** [*import number*]

#### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> <b>enable</b>	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
<b>Step 2</b>	<b>configure</b> { <b>terminal</b>   <b>memory</b>   <b>network</b> } <b>Example:</b> Device# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>router bgp as-number</b> <b>Example:</b> Device(config)# <b>router bgp 40000</b>	Enters router configuration mode to create or configure a BGP routing process.
<b>Step 4</b>	<b>neighbor</b> { <i>ip-address</i>   <i>ipv6-address</i>   <i>peer-group-name</i> } <b>Example:</b> Device(config-router)# <b>neighbor group192</b>	Accepts and attempts BGP connections to external peers residing on networks that are not directly connected.
<b>Step 5</b>	<b>address-family ipv4 vrfvrf-name</b>	Places the router in address family configuration mode.

	Command or Action	Purpose
	<b>Example:</b> Device(config-router)# <b>address-family ipv4 vrf RED</b>	<ul style="list-style-type: none"> <li>Separate VRF multipath configurations are isolated by unique route distinguisher.</li> </ul>
<b>Step 6</b>	<b>address-family ipv6 vrf vrf-name</b>  <b>Example:</b> Device(config-router)# <b>address-family ipv6 vrf RED</b>	Places the router in address family configuration mode. <ul style="list-style-type: none"> <li>Separate VRF multipath configurations are isolated by unique route distinguisher.</li> </ul>
<b>Step 7</b>	<b>neighbor {ip-address   ipv6-address   peer-group-name } update-source interface-type interface-name</b>  <b>Example:</b> Device(config-router)# <b>neighbor FE80::1234:BFF:FE0E:A471 update-source GigabitEthernet 1/0/0</b>	Specifies the link-local address over which the peering is to occur.
<b>Step 8</b>	<b>neighbor {ip-address   ipv6-address   peer-group-name } activate</b>  <b>Example:</b> Device(config-router)# <b>neighbor group192 activate</b>	Activates the neighbor or listen range peer group for the configured address family.
<b>Step 9</b>	<b>maximum-paths eibgp number [import number]</b>  <b>Example:</b> Device(config-router-af)# <b>maximum-paths eibgp 2</b>	Configures the number of parallel iBGP and eBGP routes that can be installed into a routing table.

## Verifying Multipath Load Sharing for Both eBGP and iBGP

### SUMMARY STEPS

- enable
- show ip bgp neighbors
- show ip bgp vpnv4 vrf vrf name
- show ip route vrf vrf-name

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> <b>enable</b>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show ip bgp neighbors</b>  <b>Example:</b> Device# <b>show ip bgp neighbors</b>	Displays information about the TCP and BGP connections to neighbors.

	Command or Action	Purpose
<b>Step 3</b>	<b>show ip bgp vpnv4 vrf</b> <i>vrf name</i> <b>Example:</b> Device# <b>show ip bgp vpnv4 vrf RED</b>	Displays VPN address information from the BGP table. This command is used to verify that the VRF has been received by BGP.
<b>Step 4</b>	<b>show ip route vrf</b> <i>vrf-name</i> <b>Example:</b> Device# <b>show ip route vrf RED</b>	Displays the IP routing table associated with a VRF instance. The show ip route vrf 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.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## 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](http://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.