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.

The maximum-paths feature is not supported on the IPv4 and IPv6 address families with MPLS deployments.

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.
- If pairing of equal cost routing is more than 64 unique paths, the routes are not learnt and traffic is dropped.

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 valid values for the **maximum-paths** command range from 1 to 32. However, the maximum value that can be configured is 2.

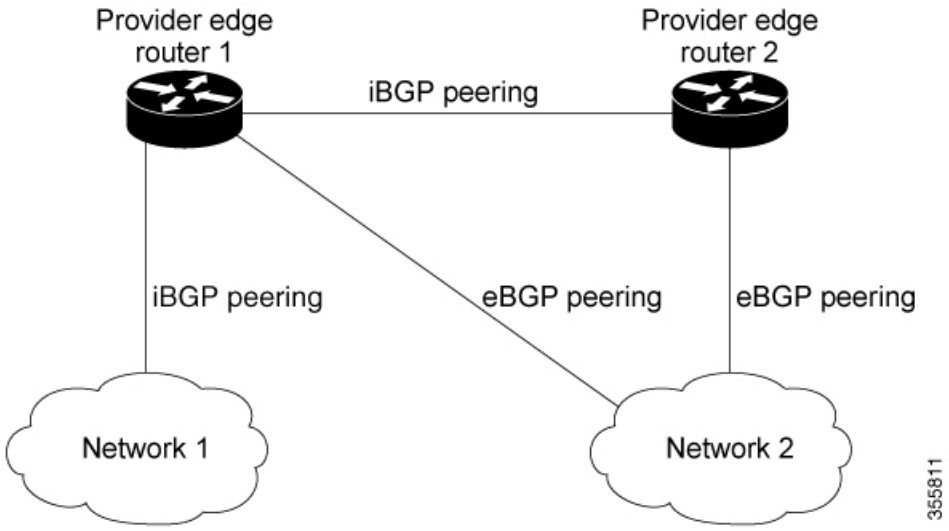
Load balancing over the multipaths is performed by CEF. CEF load balancing is configured on a per-packet round robin or on a per session (source and destination pair) basis. For information about CEF, see IP Switching Cisco Express Forwarding Configuration Guide. The BGP Multipath Load Sharing for Both 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 Connected to PE Routers



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 an iBGP in an MPLS VPN

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure** {**terminal** | **memory** | **network**} **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router bgp as-number** **Example:** `Device(config)# router bgp 40000`	Enters router configuration mode to create or configure a BGP routing process.
Step 4	**neighbor** {*ip-address* | *ipv6-address* | *peer-group-name* } **Example:** `Device(config-router)# neighbor group192`	Accepts and attempts BGP connections to external peers residing on networks that are not directly connected.
Step 5	**address-family ipv4 vrf***vrf-name* **Example:** `Device(config-router)# address-family ipv4 vrf RED`	Places the router in address family configuration mode. • Separate VRF multipath configurations are isolated by unique route distinguisher.
Step 6	**address-family ipv6 vrf***vrf-name* **Example:** `Device(config-router)# address-family ipv6 vrf RED`	Places the router in address family configuration mode. • Separate VRF multipath configurations are isolated by unique route distinguisher.
Step 7	**neighbor** {*ip-address* | *ipv6-address* | *peer-group-name* } **update-source** *interface-type interface-name* **Example:**	Specifies the link-local address over which the peering is to occur.

	Command or Action	Purpose
	`Device(config-router)# neighbor FE80::1234:BFF:FE0E:A471 update-source Gigabitethernet 1/0/0`	
Step 8	**neighbor** {*ip-address* | *ipv6-address* | *peer-group-name* } **activate** **Example:** `(config-router)# neighbor group192 activate`	Activates the neighbor or listen range peer group for the configured address family.
Step 9	**maximum-paths eibgp** [*import-number*] **Example:** `(config-router-af)# maximum-paths eibgp 2`	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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show ip bgp neighbors** **Example:** `Device# show ip bgp neighbors`	Displays information about the TCP and BGP connections to neighbors.
Step 3	**show ip bgp vpnv4 vrf***vrf name* **Example:** `Device# show ip bgp vpnv4 vrf RED`	Displays VPN address information from the BGP table. This command is used to verify that the VRF has been received by BGP.
Step 4	**show ip route vrf***vrf-name* **Example:** `Device# show ip route vrf RED`	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.

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

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

Example: Configuring eBGP and iBGP Multipath Load Sharing

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

```
Device(config)# router bgp 40000
Device(config-router)# address-family ipv4 vrf RED
Device(config-router-af)# maximum-paths eibgp 2
Device(config-router-af)# end
```

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

```
Device(config)#router bgp 40000
Device(config-router)# address-family ipv6 vrf RED
Device(config-router-af)# maximum-paths eibgp 2
Device(config-router-af)# end
```

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

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

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

Release	Feature	Feature Information
Cisco IOS XE Everest 16.6.1	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. Support for this feature was introduced only on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Fuji 16.9.1	BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS-VPN	Support for this feature was introduced only on the C9500-32C, C9500-32QC, C9500-48Y4C, and C9500-24Y4C models of the Cisco Catalyst 9500 Series Switches.

Use the Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to https://cfnng.cisco.com/

http://www.cisco.com/go/cfn.