



Implementing Multiprotocol BGP for IPv6

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This module describes how to configure multiprotocol Border Gateway Protocol (BGP) for IPv6. BGP is an Exterior Gateway Protocol (EGP) used mainly to connect separate routing domains that contain independent routing policies (autonomous systems). Connecting to a service provider for access to the Internet is a common use for BGP. BGP can also be used within an autonomous system, and this variation is referred to as internal BGP (iBGP). Multiprotocol BGP is an enhanced BGP that carries routing information for multiple network layer protocol address families; for example, the IPv6 address family and IP multicast routes. All BGP commands and routing policy capabilities can be used with multiprotocol BGP.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see 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 document.

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.

Information About Implementing Multiprotocol BGP for IPv6

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Multiprotocol BGP Extensions for IPv6

Multiprotocol BGP is the supported exterior gateway protocol (EGP) for IPv6. Multiprotocol BGP extensions for IPv6 supports many of the same features and functionality as IPv4 BGP. IPv6 enhancements to multiprotocol BGP include support for an IPv6 address family and network layer reachability information (NLRI) and next hop (the next router in the path to the destination) attributes that use IPv6 addresses.

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IPv6 Multiprotocol BGP Peer Using a Link-Local Address

An IPv6 multiprotocol BGP can be configured between two IPv6 routers (peers) using link-local addresses. For this function to work, the interface for the neighbor must be identified by using the **update-source** command, and a route map must be configured to set an IPv6 global next hop.

Multiprotocol BGP for the IPv6 Multicast Address Family

The multiprotocol BGP for the IPv6 multicast address family feature provides multicast BGP extensions for IPv6 and supports the same features and functionality as IPv4 BGP. IPv6 enhancements to multicast BGP include support for an IPv6 multicast address family and network layer reachability information (NLRI) and next hop (the next router in the path to the destination) attributes that use IPv6 addresses.

Multicast BGP is an enhanced BGP that allows the deployment of interdomain IPv6 multicast. Multiprotocol BGP carries routing information for multiple network layer protocol address families; for example, IPv6 address family and for IPv6 multicast routes. The IPv6 multicast address family contains routes used for RPF lookup by the IPv6 PIM protocol, and multicast BGP IPv6 provides for interdomain transport of the same. Users must use multiprotocol BGP for IPv6 multicast when using IPv6 multicast with BGP because the unicast BGP learned routes will not be used for IPv6 multicast.

Multicast BGP functionality is provided through a separate address family context. A subsequent address family identifier (SAFI) provides information about the type of the network layer reachability information that is carried in the attribute. Multiprotocol BGP unicast uses SAFI 1 messages, and multiprotocol BGP multicast uses SAFI 2 messages. SAFI 1 messages indicate that the routes are only usable for IP unicast, but not IP multicast. Because of this functionality, BGP routes in the IPv6 unicast RIB must be ignored in the IPv6 multicast RPF lookup.

A separate BGP routing table is maintained to configure incongruent policies and topologies (for example, IPv6 unicast and multicast) by using IPv6 multicast RPF lookup. Multicast RPF lookup is very similar to the IP unicast route lookup.

No MRIB is associated with the IPv6 multicast BGP table. However, IPv6 multicast BGP operates on the unicast IPv6 RIB when needed. Multicast BGP does not insert or update routes into the IPv6 unicast RIB.

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Nonstop Forwarding and Graceful Restart for MP-BGP IPv6 Address Family

The graceful restart capability is supported for IPv6 BGP unicast, multicast, and VPNv6 address families, enabling Cisco nonstop forwarding (NSF) functionality for BGP IPv6. The BGP graceful restart capability allows the BGP routing table to be recovered from peers without keeping the TCP state.

NSF continues forwarding packets while routing protocols converge, therefore avoiding a route flap on switchover. Forwarding is maintained by synchronizing the FIB between the active and standby RP. On

switchover, forwarding is maintained using the FIB. The RIB is not kept synchronized; therefore, the RIB is empty on switchover. The RIB is repopulated by the routing protocols and subsequently informs FIB about RIB convergence by using the `NSF_RIB_CONVERGED` registry call. The FIB tables are updated from the RIB, removing any stale entries. The RIB starts a failsafe timer during RP switchover, in case the routing protocols fail to notify the RIB of convergence.

The Cisco BGP address family identifier (AFI) model is designed to be modular and scalable, and to support multiple AFI and subsequent address family identifier (SAFI) configurations.

How to Implement Multiprotocol BGP for IPv6

When configuring multiprotocol BGP extensions for IPv6, you must create the BGP routing process, configure peering relationships, and customize BGP for your particular network.

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Configuring an IPv6 BGP Routing Process and BGP Router ID

Perform this task to configure an IPv6 BGP routing process and an optional BGP router ID for a BGP-speaking router.

BGP uses a router ID to identify BGP-speaking peers. The BGP router ID is 32-bit value that is often represented by an IPv4 address. By default, the Cisco IOS software sets the router ID to the IPv4 address of a loopback interface on the router. If no loopback interface is configured on the router, then the software chooses the highest IPv4 address configured to a physical interface on the router to represent the BGP router ID. When configuring BGP on a router that is enabled only for IPv6 (the router does not have an IPv4 address), you must manually configure the BGP router ID for the router. The BGP router ID, which is represented as a 32-bit value using an IPv4 address syntax, must be unique to the BGP peers of the router.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp *as-number***
4. **no bgp default ipv4-unicast**
5. **bgp router-id *ip-address***

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 router bgp <i>as-number</i> Example: <pre>Router(config)# router bgp 65000</pre>	Configures a BGP routing process, and enters router configuration mode for the specified routing process.
Step 4 no bgp default ipv4-unicast Example: <pre>Router(config-router)# no bgp default ipv4-unicast</pre>	Disables the IPv4 unicast address family for the BGP routing process specified in the previous step. Note Routing information for the IPv4 unicast address family is advertised by default for each BGP routing session configured with the neighbor remote-as command unless you configure the no bgp default ipv4-unicast command before configuring the neighbor remote-as command.
Step 5 bgp router-id <i>ip-address</i> Example: <pre>Router(config-router)# bgp router-id 192.168.99.70</pre>	(Optional) Configures a fixed 32-bit router ID as the identifier of the local router running BGP. Note Configuring a router ID using the bgp router-id command resets all active BGP peering sessions.

Configuring IPv6 Multiprotocol BGP Between Two Peers

By default, neighbors that are defined using the **neighbor remote-as** command in router configuration mode exchange only IPv4 unicast address prefixes. To exchange other address prefix types, such as IPv6

prefixes, neighbors must also be activated using the **neighbor activate** command in address family configuration mode for the other prefix types, as shown for IPv6 prefixes.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **neighbor** {*ip-address* | *ipv6-address*[%] | *peer-group-name*} **remote-as** *autonomous-system-number* [**alternate-as** *autonomous-system-number* ...]
5. **address-family ipv6** [**unicast** | **multicast**]
6. **neighbor** {*ip-address* | *peer-group-name* | *ipv6-address* %} **activate**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
Step 3	<p>router bgp <i>as-number</i></p> <p>Example:</p> <pre>Router(config)# router bgp 65000</pre>	<p>Enters router configuration mode for the specified routing process.</p>
Step 4	<p>neighbor {<i>ip-address</i> <i>ipv6-address</i>[%] <i>peer-group-name</i>} remote-as <i>autonomous-system-number</i> [alternate-as <i>autonomous-system-number</i> ...]</p> <p>Example:</p> <pre>Router(config-router)# neighbor 2001:DB8:0:CC00::1 remote-as 64600</pre>	<p>Adds the IPv6 address of the neighbor in the specified autonomous system to the IPv6 multiprotocol BGP neighbor table of the local router.</p>

Command or Action	Purpose
<p>Step 5 <code>address-family ipv6 [unicast multicast]</code></p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 6 <code>neighbor {ip-address peer-group-name ipv6-address %} activate</code></p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 2001:DB8:0:CC00::1 activate</pre>	<p>Enables the neighbor to exchange prefixes for the IPv6 address family with the local router.</p>

Configuring an IPv6 Multiprotocol BGP Peer Using a Link-Local Address

Configuring IPv6 multiprotocol BGP between two IPv6 routers (peers) using link-local addresses requires that the interface for the neighbor be identified by using the **update-source** command and that a route map be configured to set an IPv6 global next hop.



Note

- By default, neighbors that are defined using the **neighbor remote-as** command in router configuration mode exchange only IPv4 unicast address prefixes. To exchange other address prefix types, such as IPv6 prefixes, neighbors must also be activated using the **neighbor activate** command in address family configuration mode for the other prefix types, as shown for IPv6 prefixes.
- By default, route maps that are applied in router configuration mode using the **neighbor route-map** command are applied to only IPv4 unicast address prefixes. Route maps for other address families must be applied in address family configuration mode using the **neighbor route-map** command, as shown for the IPv6 address family. The route maps are applied either as the inbound or outbound routing policy for neighbors under the specified address family. Configuring separate route maps under each address family type simplifies managing complicated or different policies for each address family.

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SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **neighbor** { *ip-address* | *ipv6-address*[%] | *peer-group-name* } **remote-as** *autonomous-system-number* [**alternate-as** *autonomous-system-number* ...]
5. **neighbor** { *ip-address* | *ipv6-address*[%] | *peer-group-name* } **update-source** *interface-type interface-number*
6. **address-family ipv6** [**vrf** *vrf-name*] [**unicast** | **multicast** | **vpn6**]
7. **neighbor** { *ip-address* | *peer-group-name* | *ipv6-address* % } **activate**
8. **neighbor** { *ip-address* | *peer-group-name* | *ipv6-address*[%] } **route-map** *map-name* { **in** | **out** }
9. **exit**
10. Repeat Step 9.
11. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
12. **match ipv6 address** { **prefix-list** *prefix-list-name* | *access-list-name* }
13. **set ipv6 next-hop** *ipv6-address* [*link-local-address*] [**peer-address**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router bgp <i>autonomous-system-number</i> Example: Router(config)# router bgp 65000	Enters router configuration mode for the specified routing process.

Command or Action	Purpose
<p>Step 4 neighbor {<i>ip-address</i> <i>ipv6-address</i>[%] <i>peer-group-name</i>} remote-as <i>autonomous-system-number</i> [alternate-as <i>autonomous-system-number</i> ...]</p> <p>Example:</p> <pre>Router(config-router)# neighbor FE80::XXXX:BFF:FE0E:A471% remote-as 64600</pre>	<p>Adds the link-local IPv6 address of the neighbor in the specified remote autonomous system to the IPv6 multiprotocol BGP neighbor table of the local router.</p> <ul style="list-style-type: none"> The optional % keyword is the IPv6 link-local address identifier. This keyword needs to be added whenever a link-local IPv6 address is used outside the context of its interface.
<p>Step 5 neighbor {<i>ip-address</i> <i>ipv6-address</i>[%] <i>peer-group-name</i>} update-source <i>interface-type interface-number</i></p> <p>Example:</p> <pre>Router(config-router)# neighbor FE80::XXXX:BFF:FE0E:A471% update-source fastethernet0</pre>	<p>Specifies the link-local address over which the peering is to occur.</p> <ul style="list-style-type: none"> The optional % keyword is the IPv6 link-local address identifier. This keyword needs to be added whenever a link-local IPv6 address is used outside the context of its interface. If there are multiple connections to the neighbor and you do not specify the neighbor interface by using the <i>interface-type</i> and <i>interface-number</i> arguments in the neighbor update-source command, a TCP connection cannot be established with the neighbor using link-local addresses.
<p>Step 6 address-family ipv6 [<i>vrf vrf-name</i>] [unicast multicast vpn]</p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 7 neighbor {<i>ip-address</i> <i>peer-group-name</i> <i>ipv6-address</i> [%]} activate</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor FE80::XXXX:BFF:FE0E:A471% activate</pre>	<p>Enables the neighbor to exchange prefixes for the IPv6 address family with the local router using the specified link-local addresses.</p> <ul style="list-style-type: none"> The optional % keyword is the IPv6 link-local address identifier. This keyword needs to be added whenever a link-local IPv6 address is used outside the context of its interface.
<p>Step 8 neighbor {<i>ip-address</i> <i>peer-group-name</i> <i>ipv6-address</i> [%]} route-map <i>map-name</i> {in out}</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor FE80::XXXX:BFF:FE0E:A471% route-map nh6 out</pre>	<p>Applies a route map to incoming or outgoing routes.</p> <ul style="list-style-type: none"> The optional % keyword is the IPv6 link-local address identifier. This keyword needs to be added whenever a link-local IPv6 address is used outside the context of its interface.

Command or Action	Purpose
<p>Step 9 <code>exit</code></p> <p>Example:</p> <pre>Router(config-router-af)# exit</pre>	Exits address family configuration mode, and returns the router to router configuration mode.
<p>Step 10 Repeat Step 9.</p> <p>Example:</p> <pre>Router(config-router)# exit</pre>	Exits router configuration mode, and returns the router to global configuration mode.
<p>Step 11 <code>route-map map-tag [permit deny] [sequence-number]</code></p> <p>Example:</p> <pre>Router(config)# route-map nh6 permit 10</pre>	Defines a route map and enters route-map configuration mode.
<p>Step 12 <code>match ipv6 address {prefix-list prefix-list-name access-list-name}</code></p> <p>Example:</p> <pre>Router(config-route-map)# match ipv6 address prefix-list cisco</pre>	Distributes any routes that have a destination IPv6 network number address permitted by a prefix list, or performs policy routing on packets.

Command or Action	Purpose
<p>Step 13 <code>set ipv6 next-hop <i>ipv6-address</i> [<i>link-local-address</i>] [<i>peer-address</i>]</code></p> <p>Example:</p> <pre>Router(config-route-map)# set ipv6 next-hop 2001:DB8::1</pre>	<p>Overrides the next hop advertised to the peer for IPv6 packets that pass a match clause of a route map for policy routing.</p> <ul style="list-style-type: none"> The <i>ipv6-address</i> argument specifies the IPv6 global address of the next hop. It need not be an adjacent router. The <i>link-local-address</i> argument specifies the IPv6 link-local address of the next hop. It must be an adjacent router. <p>Note The route map sets the IPv6 next-hop addresses (global and link-local) in BGP updates. If the route map is not configured, the next-hop address in the BGP updates defaults to the unspecified IPv6 address (::), which is rejected by the peer. If you specify only the global IPv6 next-hop address (the <i>ipv6-address</i> argument) with the set ipv6 next-hop command after specifying the neighbor interface (the <i>interface-type</i> argument) with the neighbor update-source command in Configuring an IPv6 Multiprotocol BGP Peer Using a Link-Local Address, page 6, the link-local address of the interface specified with the <i>interface-type</i> argument is included as the next-hop in the BGP updates. Therefore, only one route map that sets the global IPv6 next-hop address in BGP updates is required for multiple BGP peers that use link-local addresses.</p>

- [Troubleshooting Tips](#), page 10

Troubleshooting Tips

If peering is not established by this task, it may be because of a missing route map **set ipv6 next-hop** command. Use the **debug bgp ipv6 update** command to display debugging information on the updates to help determine the state of the peering.

Configuring an IPv6 Multiprotocol BGP Peer Group

- By default, neighbors that are defined using the **neighbor remote-as** command in router configuration mode exchange only IPv4 unicast address prefixes. To exchange other address prefix types, such as IPv6 prefixes, neighbors must also be activated using the **neighbor activate** command in address family configuration mode for the other prefix types, as shown for IPv6 prefixes.
- By default, peer groups that are defined in router configuration mode using the **neighbor peer-group** command exchange only IPv4 unicast address prefixes. To exchange other address prefix types, such as IPv6 prefixes, you must activate peer groups using the **neighbor activate** command in address family configuration mode for the other prefix types, as shown for IPv6 prefixes.
- Members of a peer group automatically inherit the address prefix configuration of the peer group.
- IPv4 active neighbors cannot exist in the same peer group as active IPv6 neighbors. Create separate peer groups for IPv4 peers and IPv6 peers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **neighbor** *peer-group-name* **peer-group**
5. **neighbor** {*ip-address* | *ipv6-address*[%] | *peer-group-name*} **remote-as** *autonomous-system-number* [**alternate-as** *autonomous-system-number* ...]
6. **address-family ipv6** [*vrf vrf-name*] [**unicast** | **multicast** | **vpn6**]
7. **neighbor** {*ip-address* | *peer-group-name* | *ipv6-address* %} **activate**
8. **neighbor** *ip-address* | *ipv6-address*} **send-label**
9. **neighbor** {*ip-address* | *ipv6-address*} **peer-group** *peer-group-name*
10. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router bgp <i>as-number</i> Example: Router(config)# router bgp 65000	Enters router configuration mode for the specified BGP routing process.
Step 4	neighbor <i>peer-group-name</i> peer-group Example: Router(config-router)# neighbor group1 peer-group	Creates a multiprotocol BGP peer group.

Command or Action	Purpose
<p>Step 5 neighbor {<i>ip-address</i> <i>ipv6-address</i>[%] <i>peer-group-name</i>} remote-as <i>autonomous-system-number</i> [alternate-as <i>autonomous-system-number</i> ...]</p> <p>Example:</p> <pre>Router(config-router)# neighbor 2001:DB8:0:CC00::1 remote-as 64600</pre>	<p>Adds the IPv6 address of the neighbor in the specified autonomous system to the IPv6 multiprotocol BGP neighbor table of the local router.</p>
<p>Step 6 address-family ipv6 [<i>vrf vrf-name</i>] [unicast multicast vpn]</p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6 unicast</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 7 neighbor {<i>ip-address</i> <i>peer-group-name</i> <i>ipv6-address %</i>} activate</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 2001:DB8:0:CC00::1 activate</pre>	<p>Enables the neighbor to exchange prefixes for the specified family type with the neighbor and the local router.</p> <ul style="list-style-type: none"> To avoid extra configuration steps for each neighbor, use the neighbor activate command with the <i>peer-group-name</i> argument as an alternative in this step.
<p>Step 8 neighbor <i>ip-address</i> <i>ipv6-address</i>} send-label</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 192.168.99.70 send-label</pre>	<p>Advertises the capability of the router to send MPLS labels with BGP routes.</p> <ul style="list-style-type: none"> In IPv6 address family configuration mode, this command enables binding and advertisement of aggregate labels when advertising IPv6 prefixes in BGP.
<p>Step 9 neighbor {<i>ip-address</i> <i>ipv6-address</i>} peer-group <i>peer-group-name</i></p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 2001:DB8:0:CC00::1 peer-group group1</pre>	<p>Assigns the IPv6 address of a BGP neighbor to a peer group.</p>
<p>Step 10 exit</p> <p>Example:</p> <pre>Router(config-router-af)# exit</pre>	<p>Exits address family configuration mode, and returns the router to router configuration mode.</p> <ul style="list-style-type: none"> Repeat this step to exit router configuration mode and return the router to global configuration mode.

Advertising Routes into IPv6 Multiprotocol BGP



Note

By default, networks that are defined in router configuration mode using the **network** command are injected into the IPv4 unicast database. To inject a network into another database, such as the IPv6 BGP database, you must define the network using the **network** command in address family configuration mode for the other database, as shown for the IPv6 BGP database.

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SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **address-family ipv6** [*vrf vrf-name*] [**unicast** | **multicast** | **vpn6**]
5. **network** {*network-number* [**mask** *network-mask*] | *nsap-prefix*} [**route-map** *map-tag*]
6. **exit**

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3 router bgp <i>as-number</i> Example: Router(config)# router bgp 65000	Enters router configuration mode for the specified BGP routing process.

Command or Action	Purpose
<p>Step 4 address-family ipv6 [<i>vrf vrf-name</i>] [unicast multicast vpn]</p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6 unicast</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 5 network {<i>network-number</i> [mask <i>network-mask</i>] <i>nsap-prefix</i>} [route-map <i>map-tag</i>]</p> <p>Example:</p> <pre>Router(config-router-af)# network 2001:DB8::/24</pre>	<p>Advertises (injects) the specified prefix into the IPv6 BGP database. (The routes must first be found in the IPv6 unicast routing table.)</p> <ul style="list-style-type: none"> Specifically, the prefix is injected into the database for the address family specified in the previous step. Routes are tagged from the specified prefix as "local origin." The <i>ipv6-prefix</i> argument in the network command must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons. The <i>prefix-length</i> argument is a decimal value that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must precede the decimal value.
<p>Step 6 exit</p> <p>Example:</p> <pre>Router(config-router-af)# exit</pre>	<p>Exits address family configuration mode, and returns the router to router configuration mode.</p> <ul style="list-style-type: none"> Repeat this step to exit router configuration mode and return the router to global configuration mode.

Configuring a Route Map for IPv6 Multiprotocol BGP Prefixes

- By default, neighbors that are defined using the **neighbor remote-as** command in router configuration mode exchange only IPv4 unicast address prefixes. To exchange other address prefix types, such as IPv6 prefixes, neighbors must also be activated using the **neighbor activate** command in address family configuration mode for the other prefix types, as shown for IPv6 prefixes.
- By default, route maps that are applied in router configuration mode using the **neighbor route-map** command are applied to only IPv4 unicast address prefixes. Route maps for other address families must be applied in address family configuration mode using the **neighbor route-map** command, as shown for the IPv6 address family. The route maps are applied either as the inbound or outbound routing policy for neighbors under the specified address family. Configuring separate route maps under each address family type simplifies managing complicated or different policies for each address family.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **neighbor** {*ip-address* | *ipv6-address*[%] | *peer-group-name*} **remote-as** *autonomous-system-number* [**alternate-as** *autonomous-system-number* ...]
5. **address-family ipv6** [*vrf vrf-name*] [**unicast** | **multicast** | **vpn6**]
6. **neighbor** {*ip-address* | *peer-group-name* | *ipv6-address* %} **activate**
7. **neighbor** {*ip-address* | *peer-group-name* | *ipv6-address* [%]} **route-map** *map-name* {**in** | **out**}
8. **exit**
9. Repeat Step 8.
10. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
11. **match ipv6 address** {**prefix-list** *prefix-list-name* | *access-list-name*}

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router bgp <i>as-number</i> Example: Router(config)# router bgp 65000	Enters router configuration mode for the specified routing process.
Step 4	neighbor { <i>ip-address</i> <i>ipv6-address</i> [%] <i>peer-group-name</i> } remote-as <i>autonomous-system-number</i> [alternate-as <i>autonomous-system-number</i> ...] Example: Router(config-router)# neighbor 2001:DB8:0:cc00::1 remote-as 64600	Adds the link-local IPv6 address of the neighbor in the specified remote autonomous system to the IPv6 multiprotocol BGP neighbor table of the local router.

Command or Action	Purpose
<p>Step 5 address-family ipv6 [<i>vrf vrf-name</i>] [unicast multicast vpn6]</p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 6 neighbor {<i>ip-address</i> <i>peer-group-name</i> <i>ipv6-address %</i>} activate</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 2001:DB8:0:cc00::1 activate</pre>	<p>Enables the neighbor to exchange prefixes for the IPv6 address family with the local router using the specified link-local addresses.</p>
<p>Step 7 neighbor {<i>ip-address</i> <i>peer-group-name</i> <i>ipv6-address [%]</i>} route-map <i>map-name</i> {in out}</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 2001:DB8:0:cc00::1 route-map rtp in</pre>	<p>Applies a route map to incoming or outgoing routes.</p> <ul style="list-style-type: none"> Changes to the route map will not take effect for existing peers until the peering is reset or a soft reset is performed. Using the clear bgp ipv6 command with the soft and in keywords will perform a soft reset.
<p>Step 8 exit</p> <p>Example:</p> <pre>Router(config-router-af)# exit</pre>	<p>Exits address family configuration mode, and returns the router to router configuration mode.</p>
<p>Step 9 Repeat Step 8.</p> <p>Example:</p> <pre>Router(config-router)# exit</pre>	<p>Exits router configuration mode, and returns the router to global configuration mode.</p>
<p>Step 10 route-map <i>map-tag</i> [permit deny] [<i>sequence-number</i>]</p> <p>Example:</p> <pre>Router(config)# route-map rtp permit 10</pre>	<p>Defines a route map and enters route-map configuration mode.</p> <ul style="list-style-type: none"> Follow this step with a match command.

Command or Action	Purpose
<p>Step 11 <code>match ipv6 address {prefix-list prefix-list-name access-list-name}</code></p> <p>Example:</p> <pre>Router(config-route-map)# match ipv6 address prefix-list cisco</pre>	<p>Distributes any routes that have a destination IPv6 network number address permitted by a prefix list, or performs policy routing on packets.</p>

Redistributing Prefixes into IPv6 Multiprotocol BGP

Redistribution is the process of redistributing, or injecting, prefixes from one routing protocol into another routing protocol. This task explains how to inject prefixes from a routing protocol into IPv6 multiprotocol BGP. Specifically, prefixes that are redistributed into IPv6 multiprotocol BGP using the **redistribute** router configuration command are injected into the IPv6 unicast database.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp as-number**
4. **address-family ipv6 [vrf vrf-name] [unicast | multicast | vpnv6]**
5. **redistribute bgp [process-id] [metric metric-value] [route-map map-name] [source-protocol-options]**
6. **exit**

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>router bgp as-number</code></p> <p>Example:</p> <pre>Router(config)# router bgp 65000</pre>	<p>Enters router configuration mode for the specified BGP routing process.</p>

Command or Action	Purpose
<p>Step 4 <code>address-family ipv6 [vrf vrf-name] [unicast multicast vpnv6]</code></p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 5 <code>redistribute bgp [process-id] [metric metric-value] [route-map map-name] [source-protocol-options]</code></p> <p>Example:</p> <pre>Router(config-router-af)# redistribute bgp 64500 metric 5 metric-type external</pre>	<p>Redistributes IPv6 routes from one routing domain into another routing domain.</p>
<p>Step 6 <code>exit</code></p> <p>Example:</p> <pre>Router(config-router-af)# exit</pre>	<p>Exits address family configuration mode, and returns the router to router configuration mode.</p> <ul style="list-style-type: none"> Repeat this step to exit router configuration mode and return the router to global configuration mode.

Advertising IPv4 Routes Between IPv6 BGP Peers

If an IPv6 network is connecting two separate IPv4 networks, it is possible to use IPv6 to advertise the IPv4 routes. Configure the peering using the IPv6 addresses within the IPv4 address family. Set the next hop with a static route or with an inbound route map because the advertised next hop will usually be unreachable. Advertising IPv6 routes between two IPv4 peers is also possible using the same model.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **neighbor** *peer-group-name* **peer-group**
5. **neighbor** {*ip-address* | *ipv6-address*[%] | *peer-group-name*} **remote-as** *autonomous-system-number* [**alternate-as** *autonomous-system-number* ...]
6. **address-family ipv4** [**mdt** | **multicast** | **tunnel** | **unicast** [**vrf** *vrf-name*] | **vrf** *vrf-name*]
7. **neighbor** *ipv6-address* **peer-group** *peer-group-name*
8. **neighbor** {*ip-address* | *peer-group-name* | *ipv6-address* [%]} **route-map** *map-name* {**in** | **out**}
9. **exit**
10. Repeat Step 9.
11. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
12. **set ip next-hop ip-address** [... *ip-address*] [*peer-address*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router bgp <i>as-number</i> Example: Router(config)# router bgp 65000	Enters router configuration mode for the specified routing process.
Step 4	neighbor <i>peer-group-name</i> peer-group Example: Router(config-router)# neighbor 6peers peer-group	Creates a multiprotocol BGP peer group.

Command or Action	Purpose
<p>Step 5 neighbor {<i>ip-address</i> <i>ipv6-address</i>[%] <i>peer-group-name</i>} remote-as <i>autonomous-system-number</i> [alternate-as <i>autonomous-system-number</i> ...]</p> <p>Example:</p> <pre>Router(config-router)# neighbor 6peers remote-as 65002</pre>	<p>Adds the IPv6 address of the neighbor in the specified autonomous system to the IPv6 multiprotocol BGP neighbor table of the local router.</p>
<p>Step 6 address-family ipv4 [mdt multicast tunnel unicast [vrf <i>vrf-name</i>] vrf <i>vrf-name</i>]</p> <p>Example:</p> <pre>Router(config-router)# address-family ipv4</pre>	<p>Enters address family configuration mode to configure a routing session using standard IPv4 address prefixes.</p>
<p>Step 7 neighbor <i>ipv6-address</i> peer-group <i>peer-group-name</i></p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 2001:DB8:yyyy::2 peer-group 6peers</pre>	<p>Assigns the IPv6 address of a BGP neighbor to a peer group.</p>
<p>Step 8 neighbor {<i>ip-address</i> <i>peer-group-name</i> <i>ipv6-address</i> [%]} route-map <i>map-name</i> {in out}</p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 6peers route-map rmap out</pre>	<p>Applies a route map to incoming or outgoing routes.</p> <ul style="list-style-type: none"> Changes to the route map will not take effect for existing peers until the peering is reset or a soft reset is performed. Using the clear bgp ipv6 command with the soft and in keywords will perform a soft reset.
<p>Step 9 exit</p> <p>Example:</p> <pre>Router(config-router-af)# exit</pre>	<p>Exits address family configuration mode, and returns the router to router configuration mode.</p>
<p>Step 10 Repeat Step 9.</p> <p>Example:</p> <pre>Router(config-router)# exit</pre>	<p>Exits router configuration mode, and returns the router to global configuration mode.</p>

	Command or Action	Purpose
Step 11	route-map <i>map-tag</i> [permit deny] [<i>sequence-number</i>] Example: Router(config)# route-map rmap permit 10	Defines a route map and enters route-map configuration mode.
Step 12	set ip next-hop ip-address [... <i>ip-address</i>] [<i>peer-address</i>] Example: Router(config-route-map)# set ip next-hop 10.21.8.10	Overrides the next hop advertised to the peer for IPv4 packets.

Assigning BGP Administrative Distance for Multicast BGP Routes

Perform this task to specify an administrative distance for multicast BGP routes to be used in RPF lookups for comparison with unicast routes.



Caution

Changing the administrative distance of BGP internal routes is not recommended. One problem that can occur is the accumulation of routing table inconsistencies, which can break routing.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **address-family ipv6** [*vrf vrf-name*] [**unicast** | **multicast** | **vpn6**]
5. **distance bgp** *external-distance internal-distance local-distance*

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.

Command or Action	Purpose
<p>Step 3 <code>router bgp as-number</code></p> <p>Example:</p> <pre>Router(config)# router bgp 65000</pre>	Enters router configuration mode for the specified routing process.
<p>Step 4 <code>address-family ipv6 [vrf vrf-name] [unicast multicast vpv6]</code></p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 5 <code>distance bgp external-distance internal-distance local-distance</code></p> <p>Example:</p> <pre>Router(config-router-af)# distance bgp 10 50 100</pre>	Configures the administrative distance for BGP routes.

Generating IPv6 Multicast BGP Updates

Perform this task to generate IPv6 multicast BGP updates that correspond to unicast IPv6 updates received from a peer.

The MBGP translate-update feature generally is used in an MBGP-capable router that peers with a customer site that has only a BGP-capable router; the customer site has not or cannot upgrade its router to an MBGP-capable image. Because the customer site cannot originate MBGP advertisements, the router with which it peers will translate the BGP prefixes into MBGP prefixes, which are used for multicast-source Reverse Path Forwarding (RPF) lookup.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp as-number**
4. **address-family ipv6 [vrf vrf-name] [unicast | multicast | vpv6]**
5. **neighbor ipv6-address translate-update ipv6 multicast [unicast**

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>router bgp <i>as-number</i></code></p> <p>Example:</p> <pre>Router(config)# router bgp 65000</pre>	<p>Enters router configuration mode for the specified routing process.</p>
<p>Step 4 <code>address-family ipv6 [<i>vrf vrf-name</i>] [unicast multicast vpn]</code></p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family, and enters address family configuration mode.</p> <ul style="list-style-type: none"> • The unicast keyword specifies the IPv6 unicast address family. By default, the router is placed in configuration mode for the IPv6 unicast address family if the unicast keyword is not specified with the address-family ipv6 command. • The multicast keyword specifies IPv6 multicast address prefixes.
<p>Step 5 <code>neighbor <i>ipv6-address</i> translate-update ipv6 multicast [unicast]</code></p> <p>Example:</p> <pre>Router(config-router-af)# neighbor 7000::2 translate-update ipv6 multicast</pre>	<p>Generates multiprotocol IPv6 BGP updates that correspond to unicast IPv6 updates received from a peer.</p>

Configuring the IPv6 BGP Graceful Restart Capability

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `router bgp as-number`
4. `address-family ipv6 vrf vrf-name] [unicast | multicast | vpnv6]`
5. `bgp graceful-restart [restart-time seconds | stalepath-time seconds] [all]`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>router bgp as-number</code></p> <p>Example:</p> <pre>Router(config)# router bgp 65000</pre>	<p>Enters router configuration mode for the specified routing process.</p>
<p>Step 4 <code>address-family ipv6 vrf vrf-name] [unicast multicast vpnv6]</code></p> <p>Example:</p> <pre>Router(config-router)# address-family ipv6</pre>	<p>Specifies the IPv6 address family.</p>
<p>Step 5 <code>bgp graceful-restart [restart-time seconds stalepath-time seconds] [all]</code></p> <p>Example:</p> <pre>Router(config-router)# bgp graceful-restart</pre>	<p>Enables the BGP graceful restart capability.</p>

Resetting IPv6 BGP Sessions

SUMMARY STEPS

1. `enable`
2. `clear bgp ipv6 {unicast | multicast} {* | autonomous-system-number | ip-address | ipv6-address | peer-group-name} [soft] [in | out]`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 <code>clear bgp ipv6 {unicast multicast} {* autonomous-system-number ip-address ipv6-address peer-group-name} [soft] [in out]</code></p> <p>Example:</p> <pre>Router# clear bgp ipv6 unicast peer-group marketing soft out</pre>	<p>Resets IPv6 BGP sessions.</p>

Clearing External BGP Peers

SUMMARY STEPS

1. `enable`
2. `clear bgp ipv6 {unicast | multicast} external [soft] [in | out]`
3. `clear bgp ipv6 {unicast | multicast} peer-group [name]`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.

	Command or Action	Purpose
Step 2	<code>clear bgp ipv6 {unicast multicast} external [soft] [in out]</code> Example: <pre>Router# clear bgp ipv6 unicast external soft in</pre>	Clears external IPv6 BGP peers.
Step 3	<code>clear bgp ipv6 {unicast multicast} peer-group [name]</code> Example: <pre>Router# clear bgp ipv6 unicast peer-group</pre>	Clears all members of an IPv6 BGP peer group.

Clearing IPv6 BGP Route Dampening Information

SUMMARY STEPS

1. `enable`
2. `clear bgp ipv6 {unicast | multicast} dampening [ipv6-prefix prefix-length]`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<code>clear bgp ipv6 {unicast multicast} dampening [ipv6-prefix prefix-length]</code> Example: <pre>Router# clear bgp ipv6 unicast dampening 2001:DB8::/64</pre>	Clears IPv6 BGP route dampening information and unsuppresses the suppressed routes.

Clearing IPv6 BGP Flap Statistics

SUMMARY STEPS

1. `enable`
2. `clear bgp ipv6 {unicast | multicast} flap-statistics [ipv6-prefix/prefix-length | regexp regexp | filter-list list]`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>enable</code> Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 <code>clear bgp ipv6 {unicast multicast} flap-statistics [ipv6-prefix/prefix-length regexp regexp filter-list list]</code> Example: <pre>Router# clear bgp ipv6 unicast flap-statistics filter-list 3</pre>	Clears IPv6 BGP flap statistics.

Verifying IPv6 Multiprotocol BGP Configuration and Operation

SUMMARY STEPS

1. `show bgp ipv6 unicast | multicast [ipv6-prefix/prefix-length] [longer-prefixes] [labels]`
2. `show bgp ipv6 {unicast | multicast} summary`
3. `show bgp ipv6 {unicast | multicast} dampening dampened-paths`
4. `enable`
5. `debug bgp ipv6 {unicast | multicast} dampening[prefix-list prefix-list-name]`
6. `debug bgp ipv6 unicast | multicast updates[ipv6-address] [prefix-list prefix-list-name] [in| out]`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>show bgp ipv6 unicast multicast [ipv6-prefix/prefix-length] [longer-prefixes] [labels]</code> Example: <pre>Router> show bgp ipv6 unicast</pre>	(Optional) Displays entries in the IPv6 BGP routing table.
Step 2 <code>show bgp ipv6 {unicast multicast} summary</code> Example: <pre>Router> show bgp ipv6 unicast summary</pre>	(Optional) Displays the status of all IPv6 BGP connections.

Command or Action	Purpose
<p>Step 3 <code>show bgp ipv6 {unicast multicast} dampening dampened-paths</code></p> <p>Example:</p> <pre>Router> show bgp ipv6 unicast dampening dampened-paths</pre>	<p>(Optional) Displays IPv6 BGP dampened routes.</p>
<p>Step 4 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables higher privilege levels, such as privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 5 <code>debug bgp ipv6 {unicast multicast} dampening[prefix-list prefix-list-name]</code></p> <p>Example:</p> <pre>Router# debug bgp ipv6 unicast dampening</pre>	<p>(Optional) Displays debugging messages for IPv6 BGP dampening packets.</p> <ul style="list-style-type: none"> If no prefix list is specified, debugging messages for all IPv6 BGP dampening packets are displayed.
<p>Step 6 <code>debug bgp ipv6 unicast multicast} updates[ipv6-address] [prefix-list prefix-list-name] [in out]</code></p> <p>Example:</p> <pre>Router# debug bgp ipv6 unicast updates</pre>	<p>(Optional) Displays debugging messages for IPv6 BGP update packets.</p> <ul style="list-style-type: none"> If an <i>ipv6-address</i> argument is specified, debugging messages for IPv6 BGP updates to the specified neighbor are displayed. Use the in keyword to display debugging messages for inbound updates only. Use the out keyword to display debugging messages for outbound updates only.

Configuration Examples for Multiprotocol BGP for IPv6

- [Example Configuring a BGP Process, BGP Router ID, and IPv6 Multiprotocol BGP Peer, page 29](#)
- [Example Configuring an IPv6 Multiprotocol BGP Peer Using a Link-Local Address, page 29](#)
- [Example Configuring an IPv6 Multiprotocol BGP Peer Group, page 29](#)
- [Example Advertising Routes into IPv6 Multiprotocol BGP, page 30](#)
- [Example Configuring a Route Map for IPv6 Multiprotocol BGP Prefixes, page 30](#)
- [Example Redistributing Prefixes into IPv6 Multiprotocol BGP, page 30](#)
- [Example Advertising IPv4 Routes Between IPv6 Peers, page 30](#)

Example Configuring a BGP Process, BGP Router ID, and IPv6 Multiprotocol BGP Peer

The following example enables IPv6 globally, configures a BGP process, and establishes a BGP router ID. Also, the IPv6 multiprotocol BGP peer 2001:DB8:0:CC00:: is configured and activated.

```
ipv6 unicast-routing
!
router bgp 65000
no bgp default ipv4-unicast
bgp router-id 192.168.99.70
neighbor 2001:DB8:0:CC00::1 remote-as 64600
address-family ipv6 unicast
    neighbor 2001:DB8:0:CC00::1 activate
```

Example Configuring an IPv6 Multiprotocol BGP Peer Using a Link-Local Address

The following example configures the IPv6 multiprotocol BGP peer FE80::XXXX:BFF:FE0E:A471 over Fast Ethernet interface 0 and sets the route map named nh6 to include the IPv6 next-hop global address of Fast Ethernet interface 0 in BGP updates. The IPv6 next-hop link-local address can be set by the nh6 route map (not shown in the following example) or from the interface specified by the **neighbor update-source** command (as shown in the following example).

```
router bgp 65000
    neighbor FE80::XXXX:BFF:FE0E:A471 remote-as 64600
    neighbor FE80::XXXX:BFF:FE0E:A471 update-source fastethernet 0
address-family ipv6
    neighbor FE80::XXXX:BFF:FE0E:A471 activate
    neighbor FE80::XXXX:BFF:FE0E:A471 route-map nh6 out
route-map nh6 permit 10
    match ipv6 address prefix-list cisco
    set ipv6 next-hop 2001:DB8:5y6::1
ipv6 prefix-list cisco permit 2001:DB8:2Fy2::/48 le 128
ipv6 prefix-list cisco deny ::/0
```



Note

If you specify only the global IPv6 next-hop address (the *ipv6-address* argument) with the **set ipv6 next-hop** command after specifying the neighbor interface (the *interface-type* argument) with the **neighbor update-source** command, the link-local address of the interface specified with the *interface-type* argument is included as the next hop in the BGP updates. Therefore, only one route map that sets the global IPv6 next-hop address in BGP updates is required for multiple BGP peers that use link-local addresses.

Example Configuring an IPv6 Multiprotocol BGP Peer Group

The following example configures the IPv6 multiprotocol BGP peer group named group1:

```
router bgp 65000
no bgp default ipv4-unicast
neighbor group1 peer-group
neighbor 2001:DB8:0:CC00::1 remote-as 64600
address-family ipv6 unicast
    neighbor group1 activate
    neighbor 2001:DB8:0:CC00::1 peer-group group1
```

Example Advertising Routes into IPv6 Multiprotocol BGP

The following example injects the IPv6 network 2001:DB8::/24 into the IPv6 unicast database of the local router. (BGP checks that a route for the network exists in the IPv6 unicast database of the local router before advertising the network.)

```
router bgp 65000
 no bgp default ipv4-unicast
 address-family ipv6 unicast
  network 2001:DB8::/24
```

Example Configuring a Route Map for IPv6 Multiprotocol BGP Prefixes

The following example configures the route map named rtp to permit IPv6 unicast routes from network 2001:DB8::/24 if they match the prefix list named cisco:

```
router bgp 64900
 no bgp default ipv4-unicast
 neighbor 2001:DB8:0:CC00::1 remote-as 64700
 address-family ipv6 unicast
  neighbor 2001:DB8:0:CC00::1 activate
  neighbor 2001:DB8:0:CC00::1 route-map rtp in
 ipv6 prefix-list cisco seq 10 permit 2001:DB8::/24
 route-map rtp permit 10
  match ipv6 address prefix-list cisco
```

Example Redistributing Prefixes into IPv6 Multiprotocol BGP

The following example redistributes RIP routes into the IPv6 unicast database of the local router:

```
router bgp 64900
 no bgp default ipv4-unicast
 address-family ipv6 unicast
  redistribute rip
```

Example Advertising IPv4 Routes Between IPv6 Peers

The following example advertises IPv4 routes between IPv6 peers when the IPv6 network is connecting two separate IPv4 networks. Peering is configured using IPv6 addresses in the IPv4 address family configuration mode. The inbound route map named rmap sets the next hop because the advertised next hop is likely to be unreachable.

```
router bgp 65000
 !
 neighbor 6peers peer-group
 neighbor 2001:DB8:yyyy::2 remote-as 65002
 address-family ipv4
 neighbor 6peers activate
 neighbor 6peers soft-reconfiguration inbound
 neighbor 2001:DB8:yyyy::2 peer-group 6peers
 neighbor 2001:DB8:yyyy::2 route-map rmap in
 !
 route-map rmap permit 10
  set ip next-hop 10.21.8.10
```

Additional References

Related Documents

Related Topic	Document Title
IPv4 BGP configuration tasks	<i>Cisco IOS IP Routing Protocols Configuration Guide</i>
Multiprotocol BGP configuration tasks	<i>Cisco IOS IP Routing Protocols Configuration Guide</i>
BGP and multiprotocol BGP commands: complete command syntax, command mode, defaults, usage guidelines, and examples	"BGP Commands," <i>Cisco IOS IP Routing Protocols Command Reference</i>
Cisco nonstop forwarding	"Cisco Nonstop Forwarding," <i>Cisco IOS High Availability Configuration Guide</i>
IPv6 supported feature list	"Start Here: Cisco IOS Software Release Specifics for IPv6 Features," <i>Cisco IOS IPv6 Configuration Guide</i>
IPv6 commands: complete command syntax, command mode, defaults, usage guidelines, and examples	<i>Cisco IOS IPv6 Command Reference</i>

Standards

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

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 2545	<i>Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing</i>
RFC 2858	<i>Multiprotocol Extensions for BGP-4</i>
RFC 4007	<i>IPv6 Scoped Address Architecture</i>
RFC 4364	BGP MPLS/IP Virtual Private Networks (VPNs)
RFC 4382	MPLS/BGP Layer 3 Virtual Private Network (VPN) Management Information Base
RFC 4659	BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN
RFC 4724	<i>Graceful Restart Mechanism for BGP</i>

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Implementing Multiprotocol BGPfor IPv6

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 1 Feature Information for Implementing Multiprotocol BGP for IPv6

Feature Name	Releases	Feature Information
6PE Multipath	12.2(25)S 12.2(28)SB 12.2(33)SRA 12.2(33)SXI1 12.4(6)T	The 6PE multipath feature uses multiprotocol internal BGP (MP-iBGP) to distribute IPv6 routes over the MPLS IPv4 core network and to attach an MPLS label to each route.
Advertising Routes into IPv6 Multiprotocol BGP	12.0(22)S 12.2(14)S 12.2(28)SB 12.2(2)T 12.3 12.3(2)T 12.4 12.4(2)T	Users advertise (inject) a prefix into IPv6 multiprotocol BGP.
Configuring Route Maps for IPv6 Multiprotocol BGP Prefixes	12.0(22)S 12.2(14)S 12.2(28)SB 12.2(2)T 12.3 12.3(2)T 12.4 12.4(2)T	Users can configure route maps for IPv6 multiprotocol BGP prefixes.
IPv6--NSF and Graceful Restart for MP-BGP IPv6 Address Family	12.2(33)SRE 12.2(33)XNE 15.0(1)SY	The graceful restart capability is supported for IPv6 BGP unicast, multicast, and VPNv6 address families, enabling Cisco nonstop forwarding (NSF) functionality for BGP IPv6. The BGP graceful restart capability allows the BGP routing table to be recovered from peers without keeping the TCP state.
IPv6 Multicast Address Family Support for Multiprotocol BGP	12.0(26)S 12.2(25)S 12.2(28)SB 12.2(25)SG 12.2(33)SRA 12.2(33)SXH 12.3(4)T 12.4 12.4(2)T	The multiprotocol BGP for the IPv6 multicast address family feature provides multicast BGP extensions for IPv6 and supports the same features and functionality as IPv4 BGP.
IPv6 Routing--Multiprotocol BGP Extensions for IPv6	12.0(22)S 12.2(14)S 12.2(28)SB 12.2(25)SG 12.2(33)SRA 12.2(17a)SXI 12.2(2)T 12.3 12.3(2)T 12.4 12.4(2)T 15.0(1)S	Multiprotocol BGP extensions for IPv6 supports the same features and functionality as IPv4 BGP.
IPv6 Routing--Multiprotocol BGP Link-Local Address Peering	12.0(22)S 12.2(14)S 12.2(28)SB 12.2(25)SG 12.2(33)SRA 12.2(17a)SXI 12.2(4)T 12.3 12.3(2)T 12.4 12.4(2)T 15.0(1)S	IPv6 supports multiprotocol BGP link-local address peering.
Redistributing Prefixes into IPv6 Multiprotocol BGP	12.0(22)S 12.2(14)S 12.2(28)SB 12.2(2)T 12.3 12.3(2)T 12.4 12.4(2)T	Users can redistribute (inject) prefixes from another routing protocol into IPv6 multiprotocol BGP.
VRF Lite Support for IPv6	12.2(58)SE	This feature is supported.

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