



# IPv6 Routing: Multiprotocol BGP Extensions for IPv6

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## Information About IPv6 Routing: Multiprotocol BGP Extensions for IPv6

### 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 device in the path to the destination) attributes that use IPv6 addresses.

## How to Implement Multiprotocol BGP for IPv6

### 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 device.

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 router ID is set to the IPv4 address of a loopback interface on the device. If no loopback interface is configured on the device, then the software chooses the highest IPv4 address configured to a physical interface on the device to represent the BGP router ID.

When configuring BGP on a device that is enabled only for IPv6 (that is, the device does not have an IPv4 address), you must manually configure the BGP router ID for the device. 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 device.

## 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

### Procedure

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

Procedure		
	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 3	<b>router bgp</b> <i>as-number</i> <b>Example:</b> <pre>Device(config)# router bgp 65000</pre>	Enters router configuration mode for the specified routing process.
Step 4	<b>neighbor</b> { <i>ip-address</i>   <i>ipv6-address [%]</i>   <i>peer-group-name</i> } <b>remote-as</b> <i>autonomous-system-number</i> [ <b>alternate-as</b> <i>autonomous-system-number</i> ...] <b>Example:</b> <pre>Device(config-router)# neighbor 2001:DB8:0:CC00::1 remote-as 64600</pre>	Adds the IPv6 address of the neighbor in the specified autonomous system to the IPv6 multiprotocol BGP neighbor table of the local device.
Step 5	<b>address-family ipv6</b> [ <b>unicast</b>   <b>multicast</b> ] <b>Example:</b>	Specifies the IPv6 address family and enters address family configuration mode.

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

## Advertising IPv4 Routes Between IPv6 BGP Peers

If an IPv6 network is connecting two separate IPv4 networks, IPv6 can be used 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. **exit**
11. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
12. **set ip next-hop** *ip-address* [... *ip-address*] [**peer-address**]

### DETAILED STEPS

#### Procedure

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

	Command or Action	Purpose
	Device> enable	
Step 2	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
Step 3	<b>router bgp as-number</b> <b>Example:</b>  Device(config)# router bgp 65000	Enters router configuration mode for the specified routing process.
Step 4	<b>neighbor peer-group-name peer-group</b> <b>Example:</b>  Device(config-router)# neighbor 6peers peer-group	Creates a multiprotocol BGP peer group.
Step 5	<b>neighbor {ip-address   ipv6-address[%]   peer-group-name} remote-as autonomous-system-number [alternate-as autonomous-system-number ...]</b> <b>Example:</b>  Device(config-router)# neighbor 6peers remote-as 65002	Adds the IPv6 address of the neighbor in the specified autonomous system to the IPv6 multiprotocol BGP neighbor table of the local device.
Step 6	<b>address-family ipv4 [mdt   multicast   tunnel   unicast [vrf vrf-name]   vrf vrf-name]</b> <b>Example:</b>  Device(config-router)# address-family ipv4	Enters address family configuration mode to configure a routing session using standard IPv4 address prefixes.
Step 7	<b>neighbor ipv6-address peer-group peer-group-name</b> <b>Example:</b>  Device(config-router-af)# neighbor 2001:DB8:1234::2 peer-group 6peers	Assigns the IPv6 address of a BGP neighbor to a peer group.
Step 8	<b>neighbor {ip-address   peer-group-name   ipv6-address [%]} route-map map-name {in   out}</b> <b>Example:</b>  Device(config-router-af)# neighbor 6peers route-map rmap out	Applies a route map to incoming or outgoing routes. <ul style="list-style-type: none"> <li>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 <b>clear bgp ipv6</b> command with the <b>soft</b> and <b>in</b> keywords will perform a soft reset.</li> </ul>
Step 9	<b>exit</b> <b>Example:</b>  Device(config-router-af)# exit	Exits address family configuration mode, and returns the device to router configuration mode.

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

## 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

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>clear bgp ipv6</b> {unicast   multicast} external [soft] [in   out] <b>Example:</b> <pre>Device# clear bgp ipv6 unicast external soft in</pre>	Clears external IPv6 BGP peers.
<b>Step 3</b>	<b>clear bgp ipv6</b> {unicast   multicast} peer-group <i>name</i> <b>Example:</b> <pre>Device# clear bgp ipv6 unicast peer-group marketing</pre>	Clears all members of an IPv6 BGP peer group.

## Configuring BGP IPv6 Admin Distance

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### Before you begin

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### SUMMARY STEPS

- 1.

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
Step 1	Example:	

### Example

### What to do next

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## Configuration Examples for Multiprotocol BGP for IPv6

### 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::1 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 Group

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

**Example: Advertising Routes into IPv6 Multiprotocol BGP**

```

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 device. (BGP checks that a route for the network exists in the IPv6 unicast database of the local device 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 device:

```

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:DB8:1234::2 remote-as 65002
address-family ipv4
neighbor 6peers activate
neighbor 6peers soft-reconfiguration inbound
neighbor 2001:DB8:1234::2 peer-group 6peers
neighbor 2001:DB8:1234::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
IPv6 addressing and connectivity	<i>IPv6 Configuration Guide</i>
Cisco IOS commands	<a href="#">Cisco IOS Master Command List, All Releases</a>
IPv6 commands	<a href="#">Cisco IOS IPv6 Command Reference</a>
Cisco IOS IPv6 features	<a href="#">Cisco IOS IPv6 Feature Mapping</a>

### Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	<a href="#">IPv6 RFCs</a>

### MIBs

MIB	MIBs Link
—	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**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.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for IPv6 Routing Multiprotocol BGP Extensions for 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 <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

**Table 1: Feature Information for IPv6 Routing Multiprotocol BGP Extensions for IPv6**

Feature Name	Releases	Feature Information
IPv6 Routing: Multiprotocol BGP Extensions for IPv6	Cisco IOS XE Release 2.1	Multiprotocol BGP extensions for IPv6 supports the same features and functionality as IPv4 BGP.