



BGP Next Hop Propagation

The BGP Next Hop Propagation feature provides additional flexibility when designing and migrating networks. The BGP Next Hop Propagation feature allows a route reflector to modify the next hop attribute for a reflected route and allows Border Gateway Protocol (BGP) to send an update to an external BGP (eBGP) multihop peer with the next hop attribute unchanged.

Feature History for BGP Next Hop Propagation

Release	Modification
12.0(16)ST	This feature was introduced.
12.2	This feature was integrated into Cisco IOS Release 12.2.
12.2(14)S	This feature was integrated into Cisco IOS Release 12.2(14)S.
12.0(22)S	This feature was integrated into Cisco IOS Release 12.0(22)S.

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Prerequisites for BGP Next Hop Propagation

- BGP peering has been established, and the next hop is accessible.

Restrictions for BGP Next Hop Propagation

- BGP Next Hop Propagation can be configured only between multihop eBGP peers. The follow error message will be displayed if you attempt to configure this feature for a directly connect neighbor:
`%BGP: Can propagate the nexthop only to multi-hop EBGP neighbor`
- Do not use the **neighbor next-hop-self** command to modify the next hop attribute for a route reflector when this feature is enabled for a route reflector client. Using the **neighbor next-hop-self** command on the route reflector will modify next hop attributes only for routes that are learned from eBGP peers and not the intended routes that are being reflected from the route reflector clients. To modify the next hop attribute when reflecting a route, use an outbound route map.

Information About Next Hop Propagation

This section contains the following concepts:

- [BGP Next Hop Propagation Overview, page 2](#)
- [Benefits of BGP Next Hop Propagation, page 2](#)

BGP Next Hop Propagation Overview

The BGP Next Hop Propagation feature provides additional flexibility when designing and migrating networks. The BGP Next Hop Propagation feature allows a route reflector to modify the next hop attribute for a reflected route and allows BGP to send an update to an eBGP multihop peer with the next hop attribute unchanged.



Caution

Incorrectly setting BGP attributes for a route reflector can cause inconsistent routing, routing loops, or a loss of connectivity. Setting BGP attributes for a route reflector should be attempted only by an experienced network operator.

The configuration of this feature in conjunction with the iBGP Multipath Load Sharing feature allows you to use an outbound route map to include BGP route reflectors in the forwarding path.

Benefits of BGP Next Hop Propagation

The BGP Next Hop Propagation feature allows you to perform the following tasks:

- Bring the route reflector into the forwarding path, which can be used with the iBGP Multipath Load Sharing feature to configure load balancing.
- Configure interprovider Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) by not modifying the next hop attribute when advertising routes to an eBGP peer.

- Turn off the next hop calculation for an eBGP peer. This feature is useful for configuring the end-to-end connection of a label-switched path.

How to Configure BGP Next Hop Propagation

This section contains the following procedures:

- [Configuring the Route Reflector, page 3](#) (required)
- [Configuring the Route Reflector Client, page 5](#) (required)
- [Configuring the Route Reflector Client, page 5](#) (optional)

Configuring the Route Reflector

In this section, the following tasks are completed:

- A route map is created to set the next hop that will be advertised to the router reflector client. The route map is applied only to outbound routes.
- eBGP peering is configured with the route reflector client.

Restrictions

Do not use the **neighbor next-hop-self** command to modify the next hop attribute for a route reflector when this feature is enabled for a route reflector client.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
4. **set ip next-hop** *ip-address* [*peer-address*]
5. **exit**
6. **router bgp** *as-number*
7. **address-family ipv4** [**mdt** | **multicast** | **tunnel** | **unicast** [**vrf** *vrf-name*] | **vrf** *vrf-name*]
8. **neighbor** *ip-address* **activate**
9. **neighbor** *ip-address* **ebgp-multihop** *ttl*
10. **neighbor** *ip-address* **route-reflector-client**
11. **neighbor** *ip-address* **route-map** *map-tag* **in** | **out**
12. **end**

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	route-map map-tag [permit deny] [sequence-number] Example: Router(config)# route-map NEXTHOP	Enter route map configuration mode to create or configure a route map. <ul style="list-style-type: none">The route map is create to set the next hop for the route reflector client.
Step 4	set ip next-hop ip-address [peer-address] Example: Router(config-route-map)# set ip next-hop 172.16.0.1	Specifies the next hop.
Step 5	exit Example: Router(config-route-map)# exit	Exits route-map configuration mode, and enters global configuration mode.
Step 6	router bgp as-number Example: Router(config)# router bgp 65535	Enters router configuration mode, and creates a BGP routing process.
Step 7	address-family ipv4 [mdt multicast tunnel unicast [vrf vrf-name] vrf vrf-name] Example: Router(config-router-af)# address-family ipv4	Enters address family configuration mode to configure BGP peers to accept address family specific configurations.
Step 8	neighbor ip-address activate Example: Router(config-router-af)# neighbor 10.0.0.100 activate	Enables the exchange of information with the address family peer.
Step 9	neighbor ip-address ebgp-multihop ttl Example: Router(config-router-af)# neighbor 10.0.0.100 ebgp-multihop 255	Configures the local router to accept and initiate connections to external peers that reside on networks that are not directly connected.

	Command or Action	Purpose
Step 10	neighbor ip-address route-reflector-client Example: Router(config-router-af)# neighbor 10.0.0.100 route-reflector-client	Configures the local router as a BGP route reflector, and configures the specified neighbor as a route-reflector client.
Step 11	neighbor ip-address route-map map-name out Example: Router(config-router-af)# neighbor 10.0.0.100 route-map NEXTHOP out	Applies the route map to outgoing routes.
Step 12	end Example: Router(config-router-af)# end	Exits address family configuration mode, and enters privileged EXEC mode.

Examples

The following example, starting in global configuration mode, configures the local router as a route reflector and configures the 10.0.0.100 multihop peer as a route reflector client. A route map is created to set the advertised next hop to 172.16.0.1.

```
route-map NEXTHOP
  set ip next-hop 172.16.0.1
  exit
router bgp 65535
  address-family ipv4
    neighbor 10.0.0.100 activate
    neighbor 10.0.0.100 ebgp-multihop 255
    neighbor 10.0.0.100 route-reflector-client
    neighbor 10.0.0.100 route-map NEXTHOP out
  end
```

What to Do Next

To complete this configuration, the **neighbor next-hop-unchanged** command is configured on the route reflector client. Proceed to the next section to see more information.

Configuring the Route Reflector Client

In this section, the following tasks are completed:

- eBGP peering is configured with the route reflector.
- The route-reflector client is configured to propagate the next hop unchanged.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp as-number**

4. **address-family ipv4** [mdt | multicast | tunnel | unicast [vrf vrf-name] | vrf vrf-name]
5. **neighbor ip-address activate**
6. **neighbor ip-address ebgp-multihop ttl**
7. **neighbor ip-address next-hop-unchanged**
8. **end**

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 as-number Example: Router(config)# router bgp 65412	Enters router configuration mode, and creates a BGP routing process.
Step 4	address-family ipv4 [mdt multicast tunnel unicast [vrf vrf-name] vrf vrf-name] Example: Router(config-router-af)# address-family ipv4	Enter address family configuration mode to configure BGP peers to accept address family specific configurations.
Step 5	neighbor ip-address activate Example: Router(config-router-af)# neighbor 192.168.0.1 activate	Enables the exchange of information with the address family peer.
Step 6	neighbor ip-address ebgp-multihop ttl Example: Router(config-router-af)# neighbor 192.168.0.1 ebgp-multihop 255	Configures the local router to accept and initiate connections to external peers that reside on networks that are not directly connected.
Step 7	neighbor ip-address next-hop-unchanged Example: Router(config-router-af)# neighbor 192.168.0.1 activate	Configures the router to send BGP updates to BGP peers without modifying the next hop attribute.
Step 8	end Example: Router(config-router-af)# end	Exits address family configuration mode, and enters privileged EXEC mode.

Examples

The following example, starting in global configuration mode, configures the local router (route-reflector client) to establish peering with the route reflector and to propagate the next hop unchanged:

```
router bgp 65412
 address-family ipv4
  neighbor 192.168.0.1 activate
  neighbor 192.168.0.1 ebgp-multihop 255
  neighbor 192.168.0.1 next-hop-unchanged
end
```

What to Do Next

Proceed to the next section to see commands that can be used to verify the configuration of the BGP Next Hop Propagation feature.

Verifying BGP Next Hop Propagation

The configuration of the BGP Next Hop Propagation feature can be verified with the **show ip bgp neighbors EXEC** command.

SUMMARY STEPS

1. **enable**
2. **show ip bgp neighbors** [*neighbor-address*] [**received-routes** | **routes** | **advertised-routes** | {**paths regexp**} | **dampened-routes** | **received prefix-filter**]
3. **show ip bgp** [*network*] [*network-mask*] [**longer-prefixes**] [**prefix-list** *prefix-list-name* | **route-map** *route-map-name*] [**shorter prefixes** *mask-length*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>enable</pre> <p>Example: Router> enable</p>	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	<pre>show ip bgp neighbors [neighbor-address] [received-routes routes advertised-routes {paths regexp} dampened-routes received prefix-filter]]</pre> <p>Example: Router# show ip bgp neighbors</p>	Displays information about the TCP and BGP connections to neighbors. The output will display the status of the BGP Next Hop Propagation feature.
Step 3	<pre>show ip bgp [network] [network-mask] [longer-prefixes] [prefix-list prefix-list-name route-map route-map-name] [shorter prefixes mask-length]</pre> <p>Example: Router# show ip bgp</p>	Displays entries in the BGP routing table. The displayed output will indicate if the neighbor next-hop-unchanged command has been configured for the selected address.

Configuration Examples for BGP Next Hop Propagation

The following examples show how to configure this feature:

- [Router Reflector: Example, page 8](#)
- [Router Reflector Client: Example, page 9](#)

Router Reflector: Example

The following example, starting in global configuration mode, configures the local router as a route reflector and configures the 10.0.0.100 multihop peer as a route reflector client. A route map is created to set the advertised next hop to 172.16.0.1.

```
route-map NEXTHOP
 set ip next-hop 172.16.0.1
 exit
router bgp 65535
 address-family ipv4
 neighbor 10.0.0.100 activate
 neighbor 10.0.0.100 ebgp-multihop 255
 neighbor 10.0.0.100 route-reflector-client
 neighbor 10.0.0.100 route-map NEXTHOP out
 end
```

Router Reflector Client: Example

The following example, starting in global configuration mode, configures the local router (route-reflector client) to establish peering with the route reflector and to propagate the next hop unchanged:

```
router bgp 65412
 address-family ipv4
  neighbor 192.168.0.1 activate
  neighbor 192.168.0.1 ebgp-multihop 255
  neighbor 192.168.0.1 next-hop-unchanged
end
```

Additional References

The following sections provide references related to the BGP Next Hop Propagation feature.

Related Documents

Related Topic	Document Title
BGP commands and configuration tasks—The BGP Next Hop Propagation feature is an extension of the BGP routing protocol. For more information about configuring BGP, route reflectors, route summarization, and filtering, refer to the <i>Cisco IOS IP Routing Configuration Guide</i> and the <i>Cisco IOS IP Command Reference, Volume 2 of 4: Routing Protocols</i> .	<ul style="list-style-type: none"> • Cisco IOS IP Command Reference, Volume 2 of 4: Routing Protocols, Release 12.3T • Cisco IOS IP Configuration Guide, Release 12.3
iBGP multipath loadsharing—For internal BGP (iBGP) multipath load-sharing configuration and command reference information, refer to the iBGP Multipath Load Sharing feature document in the “New Features in Release 12.2(1)T” area of Cisco.com.	<ul style="list-style-type: none"> • iBGP Multipath Load Sharing

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
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

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

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, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

This section documents new commands. All other commands used with this feature are documented in the Cisco IOS command reference publications.

- [neighbor next-hop-unchanged](#)

neighbor next-hop-unchanged

To enable an external BGP (eBGP) multihop peer to propagate the next hop unchanged, use the **neighbor next-hop-unchanged** command in address family or router configuration mode. To disable next hop propagation capabilities, use the **no** form of this command.

```
neighbor ip-address | peer-group-name next-hop-unchanged
```

```
no neighbor ip-address | peer-group-name next-hop-unchanged
```

Syntax Description

<i>ip-address</i>	The IP address of the next hop.
<i>peer-group-name</i>	The name of a BGP peer group that is the next hop.

Defaults

No default behavior or values

Command Modes

Address family configuration
Router configuration

Command History

Release	Modification
12.0(16)ST	This command was introduced.
12.2	This command was integrated into Cisco IOS Release 12.2.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The **neighbor next-hop-unchanged** command is used to configured the propagate the next hop unchanged for multihop eBGP peering sessions. This command should not be configured on a route reflector, and the **neighbor next-hop-self** command should not be used to modify the next hop attribute for a route reflector when this feature is enabled for a route reflector client.

This command can be used to perform the following tasks:

- Bring the route reflector into the forwarding path, which can be used with the iBGP Multipath Load Sharing feature to configure load balancing.
- Configure interprovider Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) by not modifying the next hop attribute when advertising routes to an eBGP peer.
- Turn off the next hop calculation for an eBGP peer. This feature is useful for configuring the end-to-end connection of a label-switched path.



Caution

Incorrectly setting BGP attributes for a route reflector can cause inconsistent routing, routing loops, or a loss of connectivity. Setting BGP attributes for a route reflector should be attempted only by an experienced network operator.

Examples**Route Reflector Configuration**

In the following example, the local router is configured as a route reflector and configures the 10.0.0.100 multihop peer as a route reflector client. A route map is created to set the advertised next hop to 172.16.0.1.

```
Router(config)# route-map NEXTHOP
Router(config-route-map)# set ip next-hop 172.16.0.1
Router(config-route-map)# exit
Router(config)# router bgp 65534
Router(config-router)# neighbor 10.0.0.100 remote-as 65412
Router(config-router)# address-family ipv4
Router(config-router-af)# neighbor 10.0.0.100 activate
Router(config-router-af)# neighbor 10.0.0.100 ebgp-multihop 255
Router(config-router-af)# neighbor 10.0.0.100 route-reflector-client
Router(config-router-af)# neighbor 10.0.0.100 route-map NEXTHOP out
Router(config-router-af)# end
```

Route Reflector Client Configuration

In the following example, the local router (route-reflector client) is configured to establish peering with the route reflector and to propagate the next hop unchanged:

```
Router(config)# router bgp 65412
Router(config-router)# neighbor 192.168.0.1 remote-as 65412
Router(config-router)# address-family ipv4
Router(config-router-af)# neighbor 192.168.0.1 activate
Router(config-router-af)# neighbor 192.168.0.1 ebgp-multihop 255
Router(config-router-af)# neighbor 192.168.0.1 next-hop-unchanged
Router(config-router-af)# end
```

Related Commands

Command	Description
address-family ipv4	Enters address family configuration mode for configuring routing sessions, such as BGP, RIP, or static routing sessions, that use standard IPv4 address prefixes.
address-family vpv4	Enters address family configuration mode for configuring routing sessions, such as BGP, RIP, or static routing sessions, that use standard VPNv4 address prefixes.
neighbor ebgp-multihop	Accepts and attempts BGP connections to external peers residing on networks that are not directly connected.
neighbor route-map	Applies a route map to incoming or outgoing routes.
neighbor route-reflector-client	Configures the router as a BGP route reflector and configures the specified neighbor as its client.

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