



## BGP Prefix-Based Outbound Route Filtering

---

The BGP Prefix-Based Outbound Route Filtering feature uses Border Gateway Protocol (BGP) outbound route filter (ORF) send and receive capabilities to minimize the number of BGP updates that are sent between peer routers. The configuration of this feature can help reduce the amount of resources required for generating and processing routing updates by filtering out unwanted routing updates at the source. For example, this feature can be used to reduce the amount of processing required on a router that is not accepting full routes from a service provider network.

### Feature History for BGP Prefix-Based Outbound Route Filtering

Release	Modification
12.0(11)ST	This feature was introduced.
12.2(4)T	This feature was integrated into Cisco IOS Release 12.2(4)T.
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.

### Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.



---

**Corporate Headquarters:**  
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Copyright © 2003 Cisco Systems, Inc. All rights reserved.

# Contents

- [Prerequisites for BGP Prefix-Based Outbound Route Filtering, page 2](#)
- [Restrictions for BGP Prefix-Based Outbound Route Filtering, page 2](#)
- [Information About BGP Prefix-Based Outbound Route Filtering, page 2](#)
- [How to Configure BGP Prefix-Based Outbound Route Filtering, page 3](#)
- [Additional References, page 8](#)
- [Command Reference, page 9](#)

## Prerequisites for BGP Prefix-Based Outbound Route Filtering

BGP peering sessions must be up and running, and BGP ORF capabilities must be enabled on each participating router before a router can send or receive prefix-based ORF announcements and before the BGP Prefix-Based Outbound Route Filtering feature can be enabled.

## Restrictions for BGP Prefix-Based Outbound Route Filtering

The BGP Prefix-Based Outbound Route Filtering feature does not support IP multicast routes.

## Information About BGP Prefix-Based Outbound Route Filtering

To configure BGP prefix-based outbound route filtering, you must understand the following concepts:

- [BGP Prefix-Based Outbound Route Filtering Overview, page 2](#)
- [Enabling BGP Prefix-Based Outbound Route Filtering, page 2](#)
- [Benefits of BGP Prefix-Based Outbound Route Filtering, page 3](#)

## BGP Prefix-Based Outbound Route Filtering Overview

The BGP Prefix-Based Outbound Route Filtering feature uses Border Gateway Protocol (BGP) outbound route filter (ORF) send and receive capabilities to minimize the number of BGP updates that are sent between peer routers. The configuration of this feature can help reduce the amount of resources required for generating and processing routing updates by filtering out unwanted routing updates at the source. For example, this feature can be used to reduce the amount of processing required on a router that is not accepting full routes from a service provider network.

## Enabling BGP Prefix-Based Outbound Route Filtering

The BGP Prefix-Based Outbound Route Filtering feature is enabled through the advertisement of ORF capabilities to peer routers. The advertisement of the ORF capability indicates that a BGP-speaking router will accept a prefix list from a neighbor and apply the prefix list to locally configured ORFs (if any exist). When this capability is enabled, the BGP speaker can install the inbound prefix list filter to the remote peer as an outbound filter, which reduces unwanted routing updates.

The BGP Prefix-Based Outbound Route Filtering feature can be configured with send, receive, or send and receive ORF capabilities. The local peer advertises the ORF capability in send mode. The remote peer receives the ORF capability in receive mode and applies the filter as an outbound policy. The local and remote peers exchange updates to maintain the ORF for each router. Updates are exchanged between peer routers by address family depending on the ORF prefix list capability that is advertised. The remote peer starts sending updates to the local peer after it receives a route refresh request or an ORF prefix list with immediate status. The BGP speaker will continue to apply the inbound prefix list to received updates after the speaker pushes the inbound prefix list to the remote peer.

## Benefits of BGP Prefix-Based Outbound Route Filtering

The BGP Prefix-Based Outbound Route Filtering feature can limit the number of unwanted routing updates, which will reduce the amount of resources required for routing update generation and processing. This feature also reduces the amount of resources required to receive and discard routes that would otherwise be filtered out.

## How to Configure BGP Prefix-Based Outbound Route Filtering

This section contains the following procedures:

- [Configuring BGP Prefix-Based Outbound Route Filtering, page 3](#)
- [Verifying BGP Prefix-Based Outbound Route Filtering, page 6](#)

## Configuring BGP Prefix-Based Outbound Route Filtering

The BGP Prefix-Based Outbound Route Filtering supports prefix length matching, wild-card based prefix matching, and exact address prefix matching for address family support. This feature can be configured on a router to send or receive ORF capabilities with either the **send** or **receive** keywords. This feature can also be configured on a router to both send and receive ORF capabilities with the **both** keyword.

### Prerequisites

BGP peering sessions must be up and running, and BGP ORF capabilities must be enabled on each participating router before a router can send or receive prefix-based ORF announcements and before the BGP Prefix-Based Outbound Route Filtering feature can be configured.

### Restrictions

The BGP Prefix-Based Outbound Route Filtering feature does not support multicast.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **address-family** {*ipv4* | *ipv6* | *vpn4*} [**multicast** | **unicast** | **vrf** {*vrf-name*}]

5. **neighbor** *ip-address* **remote-as** *as-number*
6. **neighbor** *ip-address* **capability prefixlist-orf** [**send** | **receive** | **both**]
7. **exit**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><b>enable</b></p> <p><b>Example:</b> Router&gt; enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<p><b>configure terminal</b></p> <p><b>Example:</b> Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><b>router bgp</b> <i>as-number</i></p> <p><b>Example:</b> Router(config)# router bgp 100</p>	<p>Enters router configuration mode, and creates a BGP routing process.</p>
Step 4	<p><b>address-family</b> <i>ipv4</i>   <i>ipv6</i>   <i>vpn</i><i>v4</i> [<b>multicast</b>   <b>unicast</b>   <b>vrf</b> {<i>vrf-name</i>}]</p> <p><b>Example:</b> Router(config-router-af)# address-family ipv4 unicast</p>	<p>Enter address family configuration mode to configure BGP peers to accept address family specific configurations.</p> <ul style="list-style-type: none"> <li>The example command creates an IPv4 unicast address family session.</li> </ul>
Step 5	<p><b>neighbor</b> <i>ip-address</i> <b>remote-as</b> <i>as-number</i></p> <p><b>Example:</b> Router(config-router)# neighbor 10.1.1.1 remote-as 200</p>	<p>Establishes peering with the specified neighbor or peer-group.</p> <ul style="list-style-type: none"> <li>In this step, you are establishing an eBGP session with the peer router to exchange ORF capabilities.</li> </ul>
Step 6	<p><b>neighbor</b> <i>ip-address</i> <b>capability prefixlist-orf</b> [<b>send</b>   <b>receive</b>   <b>both</b>]</p> <p><b>Example:</b> Router(config-router)# neighbor 10.1.1.1 capability prefixlist-orf both</p>	<p>Enables the ORF prefix list capability on a router.</p> <ul style="list-style-type: none"> <li>The ORF capability can be enabled in send or receive mode with the corresponding keywords. ORF capabilities can also be enabled in send and receive mode with the <b>both</b> keyword.</li> </ul>
Step 7	<p><b>exit</b></p> <p><b>Example:</b> Router(config)# exit</p>	<p>Exits router configuration mode, and enters global configuration mode.</p>
Step 8	<p><b>access-list</b> <i>access-list-number</i> {<b>deny</b> <b>permit</b>}</p> <p><b>Example:</b> Router(config)# eaccess-list 10 permit 192.168.1.0 0.0.0.255</p>	<p>Defines the access list for prefix based filtering.</p> <ul style="list-style-type: none"> <li>This feature supports prefix length matching, wild-card based prefix matching, and exact address prefix matching for address family support.</li> </ul>

	Command or Action	Purpose
Step 9	<b>exit</b>  <b>Example:</b> Router(config)# exit	Exits global configuration mode, and enters privileged EXEC mode.
Step 10	<b>clear ip bgp {ip-address   *} in prefix-filter</b>  <b>Example:</b> Router(config)# clear ip bgp 192.168.1.2 in prefix-filter	(Optional) Clears BGP ORFs and initiates an inbound soft reset. A single neighbor or all neighbors can be specified. <ul style="list-style-type: none"> <li>When this command is used without the prefix-filter keyword, a normal route refresh is performed. This command should be used when inbound routing policy changes other than a prefix list filter occur, such as a route map change.</li> </ul>

## Examples

The following example configures Router-A to advertise prefix-based ORF send capabilities to Router-B (172.16.1.2):

```
router bgp 100
 address-family ipv4 unicast
 neighbor 172.16.1.2 remote-as 200
 neighbor 172.16.1.2 capability orf prefix-list send
 exit
```

The following example configures Router-B to advertise prefix-based ORF receive capabilities to Router-A (10.1.1.1). This example also creates the prefix filter to permit route from the 192.168.1.0 network.

```
router bgp 200
 address-family ipv4 unicast
 neighbor 10.1.1.1 remote-as 100
 neighbor 10.1.1.1 capability orf prefix-filter receive
 neighbor 10.1.1.1 distribute-list 10 in
 exit
access-list 10 permit 192.168.1.0 0.0.0.255
!
```

The following example configures Router-A to advertise both send and receive prefix-based ORF capabilities to Router-B (192.168.1.2) and to initiate an inbound soft reset with Router-B:

```
router bgp 100
 address-family ipv4 unicast
 neighbor 192.168.1.2 remote-as 200
 neighbor 192.168.1.2 capability orf prefix-list both
 exit
clear ip bgp 192.168.1.2 in prefix-filter
!
```

## What to Do Next

You can verify that this feature is configured correctly with the **show running-config** and **show ip bgp neighbors** command. Go to the [Verifying BGP Prefix-Based Outbound Route Filtering](#) section for instructions and example output.

## Verifying BGP Prefix-Based Outbound Route Filtering

To verify that the BGP Prefix-Based Outbound Route Filtering feature has been configured on peer routers, use the **show ip bgp neighbor** command in privileged EXEC mode. This command is used to display information about the TCP and BGP connections to neighbors. The status and type of ORF capabilities advertised and received is displayed in the output. Use the **show running-config** command in privileged EXEC mode to verify the local configuration of this feature.

See the following examples. The relevant lines of the output are in bold text.

- [Verifying BGP Prefix-Based Outbound Route Filtering Configured in Send Mode, page 6](#)
- [Verifying BGP Prefix-Based Outbound Route Filtering Configured in Receive Mode, page 7](#)
- [Verifying BGP Prefix-Based Outbound Route Filtering Configured in Send and Receive Modes, page 7](#)

### Verifying BGP Prefix-Based Outbound Route Filtering Configured in Send Mode

The following example output from the **show running-config** privileged EXEC command shows that neighbor 192.168.20.72 is configured with the prefix-based ORF feature in send mode:

```
Router# show running-config | begin bgp
router bgp 1
  bgp log-neighbor-changes
  network 10.0.0.0
  network 172.16.1.2
  neighbor 192.168.20.72 remote-as 2
  neighbor 192.168.20.72 capability orf prefix-list send
!
```

The following example output from the **show ip bgp neighbors** privileged EXEC command shows that neighbor 192.168.20.72 is configured with the prefix-based ORF feature in send mode:

```
Router# show ip bgp neighbors 192.168.20.72
BGP neighbor is 192.168.20.72, remote AS 2, external link
  BGP version 4, remote router ID 172.16.1.2
  BGP state = Established, up for 00:13:27
  Last read 00:00:27, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh:advertised and received(new)
    Address family IPv4 Unicast:advertised and received
  Received 36 messages, 0 notifications, 0 in queue
  Sent 36 messages, 0 notifications, 0 in queue
  Default minimum time between advertisement runs is 30 seconds

For address family:IPv4 Unicast
  BGP table version 13, neighbor version 13
  Index 1, Offset 0, Mask 0x2
  AF-dependant capabilities:
    Outbound Route Filter (ORF) type (128) Prefix-list:
      Send-mode:advertised, received
      Receive-mode:received
  Route refresh request:received 4, sent 2
  2 accepted prefixes consume 80 bytes
  Prefix advertised 8, suppressed 0, withdrawn 2
```

## Verifying BGP Prefix-Based Outbound Route Filtering Configured in Receive Mode

The following example output from the **show running-config** privileged EXEC command shows that neighbor 172.16.1.2 is configured with the prefix-based ORF feature in receive mode:

```
Router# show running-config | begin bgp
router bgp 1
  bgp log-neighbor-changes
  network 10.0.0.0
  network 192.168.20.72
  neighbor 172.16.1.2 remote-as 2
  neighbor 172.16.1.2 capability orf prefix-list receive
!
```

The following example output from the **show ip bgp neighbors** privileged EXEC command shows that neighbor 172.16.1.2 is configured with the prefix-based ORF feature in receive mode:

```
Router# show ip bgp neighbors 172.16.1.2
BGP neighbor is 172.16.1.2, remote AS 2, external link
  BGP version 4, remote router ID 192.168.20.72
  BGP state = Established, up for 00:02:47
  Last read 00:00:46, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh:advertised and received(new)
    Address family IPv4 Unicast:advertised and received
    Received 45 messages, 0 notifications, 0 in queue
    Sent 44 messages, 0 notifications, 0 in queue
    Default minimum time between advertisement runs is 30 seconds

For address family:IPv4 Unicast
  BGP table version 17, neighbor version 17
  Index 1, Offset 0, Mask 0x2
  AF-dependant capabilities:
    Outbound Route Filter (ORF) type (128) Prefix-list:
      Send-mode:received
      Receive-mode:advertised, received
    Route refresh request:received 5, sent 2
    2 accepted prefixes consume 80 bytes
    Prefix advertised 10, suppressed 0, withdrawn 2
```

## Verifying BGP Prefix-Based Outbound Route Filtering Configured in Send and Receive Modes

The following example output from the **show running-config** privileged EXEC command shows that neighbor 192.168.20.72 is configured with the prefix-based ORF feature in both send and receive modes:

```
Router# show running-config | begin bgp
router bgp 1
  bgp log-neighbor-changes
  network 10.0.0.0
  network 172.16.1.2
  neighbor 192.168.20.72 remote-as 2
  neighbor 192.168.20.72 capability orf prefix-list both
!
```

The following example output from the **show ip bgp neighbors** privileged EXEC command shows that neighbor 192.168.20.72 is configured with the prefix-based ORF feature in both send and receive modes:

```
Router# show ip bgp neighbors 192.168.20.72
BGP neighbor is 192.168.20.72, remote AS 2, external link
  BGP version 4, remote router ID 172.16.1.2
```

```

BGP state = Established, up for 00:00:09
Last read 00:00:09, hold time is 180, keepalive interval is 60 seconds
Neighbor capabilities:
  Route refresh:advertised and received(new)
  Address family IPv4 Unicast:advertised and received
Received 57 messages, 0 notifications, 0 in queue
Sent 56 messages, 0 notifications, 0 in queue
Default minimum time between advertisement runs is 30 seconds

For address family:IPv4 Unicast
BGP table version 21, neighbor version 19
Index 1, Offset 0, Mask 0x2
AF-dependant capabilities:
  Outbound Route Filter (ORF) type (128) Prefix-list:
    Send-mode:advertised, received
    Receive-mode:advertised, received
Route refresh request:received 6, sent 3
2 accepted prefixes consume 80 bytes
Prefix advertised 12, suppressed 0, withdrawn 2

```

## Additional References

The following sections provide references related to BGP Prefix-Based Outbound Route Filtering feature.

## Related Documents

Related Topic	Document Title
For more information about IP access lists, refer to the IP address and services chapters in the IP configuration guide and command reference.	<ul style="list-style-type: none"> <li><a href="#">Cisco IOS IP Configuration Guide, Release 12.3</a></li> <li><a href="#">Cisco IOS IP Command Reference, Volume 1 of 4: Addressing and Services, Release 12.3</a></li> </ul>
The BGP Prefix-Based Outbound Route Filtering feature is an extension of the BGP routing protocol. For more information about configuring BGP and configuring route summarization and filtering, refer to the “Configuring BGP” chapter of the Cisco IOS IP Configuration Guide and the Cisco IOS IP Command Reference.	<ul style="list-style-type: none"> <li><a href="#">Cisco IOS IP Configuration Guide, Release 12.3</a></li> <li><a href="#">Cisco IOS IP Command Reference, Volume 2 of 4: Routing Protocols, Release 12.3</a></li> </ul>

## 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:  <a href="http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a>

## RFCs

RFCs	Title
draft-chen-bgp-prefix-orf-06.txt	<i>Address Prefix Based Outbound Route Filter for BGP-4</i>
draft-ietf-idr-route-filter-09.txt	<i>Cooperative Route Filtering Capability for BGP-4</i>

## 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.	TAC Home Page: <a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>  BGP Support Page: <a href="http://www.cisco.com/cgi-bin/Support/browse/psp_view.pl?p=Inter networking:BGP">http://www.cisco.com/cgi-bin/Support/browse/psp_view.pl?p=Inter networking:BGP</a>

## Command Reference

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

### New Commands

- [clear ip bgp in prefix-filter](#)
- [neighbor orf prefix-filter](#)

### Modified Commands

- [show ip bgp neighbors](#)

# clear ip bgp in prefix-filter

To clear a BGP outbound route filter (ORF) and initiate an inbound soft reset, use the **clear ip bgp in prefix-filter** command in privileged EXEC mode.

**clear ip bgp** {*ip-address* | \*} **in prefix filter**

Syntax Description		
	*	Clears all ORFs and resets all inbound BGP sessions.
	<i>ip-address</i>	(Optional) IP address of the network about which to clear dampening information.

**Defaults** The **prefix-filter** keyword will be ignored and a normal inbound route refresh will be performed if the ORF capability has not been received or the send capability has not been enabled.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(11)ST	This command was introduced.
	12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
	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** This command is used to push out the existing ORF prefix list so that a new route refresh will be received from a neighbor. When this command is used without the **prefix-filter** keyword, a normal route refresh is performed. This command should be used when inbound routing policy changes other than a prefix list filter occur, such as a route map change.

**Examples** The following example clears BGP ORFs for the 192.168.0.1 neighbor initiate an inbound soft reset:

```
Router# clear ip bgp 192.168.0.1 in prefix-filter
```

Related Commands	Command	Description
	<a href="#">neighbor orf prefix-filter</a>	Advertises ORF capabilities to peer routers.
	<a href="#">show ip bgp neighbors</a>	Displays information about the TCP and BGP connections to neighbors.

# neighbor orf prefix-filter

To advertise outbound route filter (ORF) capabilities to a peer router, use the **neighbor orf prefix-filter** command in address family or router configuration mode. To disable ORF capabilities, use the **no** form of this command.

```
neighbor {ip-address} [capability] orf prefix-filter [both | receive | send]
```

```
no neighbor {ip-address} [capability] orf prefix-filter [both | receive | send]
```

## Syntax Description

<i>ip-address</i>	The IP address of the neighbor router.
<b>capability</b>	(optional) Informs the specified neighbor that this router has ORF capabilities.
<b>both</b>	(optional) Enables the ORF prefix list capability in both receive and send modes.
<b>receive</b>	(optional) Enables the ORF prefix list capability in receive mode.
<b>send</b>	(optional) Enables the ORF prefix list capability in send mode.

## Defaults

Disabled

## Command Modes

Address family configuration

Router configuration

## Command History

Release	Modification
12.0(11)ST	This command was introduced.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
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 prefix-filter** command is used to reduce the number of BGP prefixes that a BGP speaker sends or receives from a peer router based on prefix filtering.

In most configurations, this command will be used to advertise both send and receive ORF capabilities with the **both** keyword. However this feature can be configured in one direction between two routers with one router configured to send ORF capabilities and another router configured to receive ORF capabilities from the first router.

## Examples

The following example configures the router to advertise ORF send capabilities to neighbor 172.16.1.2:

```
router bgp 100
  neighbor 176.16.1.2 capability orf prefix-filter send
```

The following example configures the router to advertise ORF receive capabilities to neighbor 10.1.1.1:

```
router bgp 100
  neighbor 10.1.1.1 capability orf prefix-filter receive
```

The following example configures the router to advertise ORF receive capabilities to neighbor 192.168.1.2:

```
router bgp 100
  neighbor 192.168.1.2 capability orf prefix-filter both
```

---

**Related Commands**

Command	Description
<a href="#">neighbor distribute-list</a>	Distributes BGP neighbor information as specified in an access list.
<a href="#">neighbor prefix-list</a>	Distributes BGP neighbor information as specified in a prefix list.

# show ip bgp neighbors

To display information about the TCP and Border Gateway Protocol (BGP) connections to neighbors, use the **show ip bgp neighbors** command in EXEC mode.

**show ip bgp neighbors** [*neighbor-address*] [**received-routes** | **routes** | **advertised-routes** | {**paths** *regex*} | **dampened-routes**] [**received prefix-filter**]

## Syntax Description

<i>neighbor-address</i>	(Optional) Address of the neighbor whose routes you have learned from. If you omit this argument, all neighbors are displayed.
<b>received-routes</b>	(Optional) Displays all received routes (both accepted and rejected) from the specified neighbor.
<b>routes</b>	(Optional) Displays all routes that are received and accepted. This is a subset of the output from the <b>received-routes</b> keyword.
<b>advertised-routes</b>	(Optional) Displays all the routes the router has advertised to the neighbor.
<b>paths</b> <i>regex</i>	(Optional) Regular expression that is used to match the paths received.
<b>dampened-routes</b>	(Optional) Displays the dampened routes to the neighbor at the IP address specified.
<b>received prefix-filter</b>	(Optional) Displays the configured prefix list filter for the specified IP address

## Command Modes

EXEC

## Command History

Release	Modification
10.0	This command was introduced.
11.2	The <b>received-routes</b> keyword was added.
12.2(4)T	The <b>received prefix-filter</b> keyword was added.
12.2(14)S	
12.0(22)S	

## Examples

The following is sample output from the **show ip bgp neighbors** command in privileged EXEC mode:

```
Router# show ip bgp neighbors 172.16.232.178

BGP neighbor is 172.16.232.178, remote AS 35, external link
  BGP version 4, remote router ID 192.168.3.3
  BGP state = Established, up for 1w1d
  Last read 00:00:53, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received
    Address family IPv4 Unicast: advertised and received
    Address family IPv4 Multicast: advertised and received
  Received 12519 messages, 0 notifications, 0 in queue
  Sent 12523 messages, 0 notifications, 0 in queue
  Route refresh request: received 0, sent 0
  Minimum time between advertisement runs is 30 seconds
```

## show ip bgp neighbors

```

For address family: IPv4 Unicast
  BGP table version 5, neighbor version 5
  Index 1, Offset 0, Mask 0x2
  Community attribute sent to this neighbor
  Inbound path policy configured
  Outbound path policy configured
  Route map for incoming advertisements is uni-in
  Route map for outgoing advertisements is uni-out
  3 accepted prefixes consume 108 bytes
  Prefix advertised 6, suppressed 0, withdrawn 0

For address family: IPv4 Multicast
  BGP table version 5, neighbor version 5
  Index 1, Offset 0, Mask 0x2
  Inbound path policy configured
  Outbound path policy configured
  Route map for incoming advertisements is mul-in
  Route map for outgoing advertisements is mul-out
  3 accepted prefixes consume 108 bytes
  Prefix advertised 6, suppressed 0, withdrawn 0

Connections established 2; dropped 1
  Last reset lwd, due to Peer closed the session
  Connection state is ESTAB, I/O status: 1, unread input bytes: 0
  Local host: 172.16.232.178, Local port: 179
  Foreign host: 172.16.232.179, Foreign port: 11002

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x2CF49CF8):
Timer           Starts      Wakeups      Next
Retrans         12518         0            0x0
TimeWait        0             0            0x0
AckHold         12514         12281        0x0
SendWnd         0             0            0x0
KeepAlive       0             0            0x0
GiveUp         0             0            0x0
PmtuAger        0             0            0x0
DeadWait        0             0            0x0

iss: 273358651  snduna: 273596614  sndnxt: 273596614  sndwnd: 15434
irs: 190480283  rcvnxt: 190718186  rcvwnd: 15491  delrcvwnd: 893

SRTT: 300 ms, RTTO: 607 ms, RTV: 3 ms, KRTT: 0 ms
minRTT: 0 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs

Datagrams (max data segment is 1460 bytes):
Rcvd: 24889 (out of order: 0), with data: 12515, total data bytes: 237921
Sent: 24963 (retransmit: 0), with data: 12518, total data bytes: 237981

```

Table 1 describes the significant fields shown in the display.

**Table 1** *show ip bgp neighbors Field Descriptions*

Field	Description
BGP neighbor	IP address of the BGP neighbor and its autonomous system number. If the neighbor is in the same autonomous system as the router, then the link between them is internal; otherwise, it is considered external.
remote AS	Autonomous system of the neighbor.
external link	Indicates that this peer is an external BGP (eBGP) peer.
BGP version	BGP version being used to communicate with the remote router; the router ID (an IP address) of the neighbor is also specified.
remote router ID	IP address of the neighbor.
BGP state	Internal state of this BGP connection.
up for	Amount of time, in seconds, that the underlying TCP connection has been in existence.
Last read	Time that BGP last read a message from this neighbor.
hold time	Maximum amount of time that can elapse between messages from the peer.
keepalive interval	Time period, in seconds, between sending keepalive packets, which help ensure that the TCP connection is up.
Neighbor capabilities	BGP capabilities advertised and received from this neighbor.
Route refresh	Indicates that the neighbor supports dynamic soft reset using the route refresh capability.
Address family IPv4 Unicast:	IP Version 4 unicast-specific properties of this neighbor.
Address family IPv4 Multicast:	IP Version 4 multicast-specific properties of this neighbor.
Received notifications	Number of total BGP messages received from this peer, including keepalives.
Sent notifications	Number of error messages received from the peer.
Received notifications	Total number of BGP messages that have been sent to this peer, including keepalives.
Sent notifications	Number of error messages the router has sent to this peer.
Route refresh request: advertisement runs	Number of route refresh requests sent and received from this neighbor.
For address family:	Value of the minimum advertisement interval.
BGP table version	Address family to which the following fields refer.
neighbor version	Indicates that the neighbor has been updated with this version of the primary BGP routing table.
Community attribute	Number used by the software to track the prefixes that have been sent and those that must be sent to this neighbor.
Inbound path policy	Appears if the <b>neighbor send-community</b> command is configured for this neighbor.
Outbound path policy	Indicates if an inbound policy is configured.
	Indicates if an outbound policy is configured.

**Table 1** *show ip bgp neighbors Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
mul-in	Name of the inbound route map for the multicast address family.
mul-out	Name of the outbound route map for the multicast address family.
accepted prefixes	Number of prefixes accepted.
Prefix advertised	Number of prefixes advertised.
suppressed	Number of prefixes suppressed.
withdrawn	Number of prefixes withdrawn.
Connections established	Number of times the router has established a TCP connection and the two peers have agreed to speak BGP with each other.
dropped	Number of times that a good connection has failed or been taken down.
Last reset	Elapsed time, in seconds, since this peering session was last reset.
Connection state	State of the BGP peer.
unread input bytes	Number of bytes of packets still to be processed.
Local host, Local port	Peering address of local router, plus port.
Foreign host, Foreign port	Peering address of the neighbor.
Event Timers	Table that displays the number of starts and wakeups for each timer.
iss	Initial send sequence number.
snduna	Last send sequence number the local host sent but for which it has not received an acknowledgment.
sndnxt	Sequence number the local host will send next.
sndwnd	TCP window size of the remote host.
irs	Initial receive sequence number.
rcvnxt	Last receive sequence number the local host has acknowledged.
rcvwnd	TCP window size of the local host.
delrcvwnd	Delayed receive window—data the local host has read from the connection, but has not yet subtracted from the receive window the host has advertised to the remote host. The value in this field gradually increases until it is larger than a full-sized packet, at which point it is applied to the rcvwnd field.
SRTT	A calculated smoothed round-trip timeout.
RTTO	Round-trip timeout.
RTV	Variance of the round-trip time.
KRTT	New round-trip timeout (using the Karn algorithm). This field separately tracks the round-trip time of packets that have been re-sent.
minRTT	Smallest recorded round-trip timeout (hard wire value used for calculation).
maxRTT	Largest recorded round-trip timeout.
ACK hold	Time the local host will delay an acknowledgment in order to piggyback data on it.
Flags	IP precedence of the BGP packets.

**Table 1** *show ip bgp neighbors Field Descriptions (continued)*

Field	Description
Datagrams: Rcvd	Number of update packets received from a neighbor.
with data	Number of update packets received with data.
total data bytes	Total bytes of data.
Sent	Number of update packets sent.
with data	Number of update packets with data sent.
total data bytes	Total number of data bytes.

The following is sample output from the **show ip bgp neighbors** command with the **advertised-routes** keyword in privileged EXEC mode:

```
Router# show ip bgp neighbors 172.16.232.178 advertised-routes

BGP table version is 27, local router ID is 172.16.232.181
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop          Metric LocPrf Weight Path
*>i1110.0.0.0      172.16.232.179      0     100     0 ?
*> 200.2.2.0       0.0.0.0             0           32768 i
```

The following is sample output from the **show ip bgp neighbors** command with the **routes** keyword in privileged EXEC mode:

```
Router# show ip bgp neighbors 172.16.232.178 routes

BGP table version is 27, local router ID is 172.16.232.181
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop          Metric LocPrf Weight Path
*> 10.0.0.0         172.16.232.178      40           0 10 ?
*> 20.0.0.0         172.16.232.178      40           0 10 ?
```

Table 2 describes the significant fields shown in the displays.

**Table 2** *show ip bgp neighbors advertised-routes and routes Field Descriptions*

Field	Description
BGP table version	Internal version number of the table. This number is incremented whenever the table changes.
local router ID	IP address of the router.
Status codes	Status of the table entry. The status is displayed at the beginning of each line in the table. It can be one of the following values: s—The table entry is suppressed. *—The table entry is valid. >—The table entry is the best entry to use for that network. i—The table entry was learned via an internal BGP (iBGP) session.
Origin codes	Origin of the entry. The origin code is placed at the end of each line in the table. It can be one of the following values: i—Entry originated from Interior Gateway Protocol (IGP) and was advertised with a <b>network</b> router configuration command. e—Entry originated from Exterior Gateway Protocol (EGP). ?—Origin of the path is not clear. Usually, this is a router that is redistributed into BGP from an IGP.
Network	IP address of a network entity.
Next Hop	IP address of the next system that is used when forwarding a packet to the destination network. An entry of 0.0.0.0 indicates that the router has some non-BGP routes to this network.
Metric	If shown, this is the value of the interautonomous system metric. This field is frequently not used.
LocPrf	Local preference value as set with the <b>set local-preference</b> route-map configuration command. The default value is 100.
Weight	Weight of the route as set via autonomous system filters.
Path	Autonomous system paths to the destination network. There can be one entry in this field for each autonomous system in the path.

The following is sample output from the **show ip bgp neighbors** command with the **paths** keyword in privileged EXEC mode:

```
Router# show ip bgp neighbors 171.69.232.178 paths ^10

Address      Refcount Metric Path
0x60E577B0      2      40 10 ?
```

Table 3 describes the significant fields shown in the display.

**Table 3** *show ip bgp neighbors paths Field Descriptions*

Field	Description
Address	Internal address where the path is stored.
Refcount	Number of routes using that path.
Metric	The Multi Exit Discriminator (MED) metric for the path. (The name of this metric for BGP versions 2 and 3 is INTER_AS.)
Path	The autonomous system path for that route, followed by the origin code for that route.

The following is sample output from the **show ip bgp neighbors** command with the **received prefix-filter** keyword in privileged EXEC mode:

```
Router# show ip bgp neighbor 192.168.20.72 received prefix-filter
Address family:IPv4 Unicast
ip prefix-list 192.168.20.72:1 entries
    seq 5 deny 10.0.0.0/8 le 32
```

Table 4 describes the significant fields shown in the display.

**Table 4** *show ip bgp neighbors paths Field Descriptions*

Field	Description
Address family:	The configured address family mode.
ip prefix-list ...	The configured prefix list for the specified neighbor.

■ show ip bgp neighbors