Configuring Advanced BGP

This chapter describes how to configure advanced features of the Border Gateway Protocol (BGP) on the Cisco NX-OS switch.

This chapter includes the following sections:

Information About Advanced BGP

BGP is an interdomain routing protocol that provides loop-free routing between organizations or autonomous systems. Cisco NX-OS supports BGP version 4. BGP version 4 includes multiprotocol extensions that allow BGP to carry routing information for IP multicast routes and multiple Layer 3 protocol address families. BGP uses TCP as a reliable transport protocol to create TCP sessions with other BGP-enabled switches called BGP peers. When connecting to an external organization, the router creates external BGP (eBGP) peering sessions. BGP peers within the same organization exchange routing information through internal BGP (iBGP) peering sessions.

This section includes the following topics:

Peer Templates

BGP peer templates allow you to create blocks of common configurations that you can reuse across similar BGP peers. Each block allows you to define a set of attributes that a peer then inherits. You can choose to override some of the inherited attributes as well, making it a very flexible scheme for simplifying the repetitive nature of BGP configurations.

Cisco NX-OS implements three types of peer templates:

- The *peer-session* template defines BGP peer session attributes, such as the transport details, remote autonomous system number of the peer, and session timers. A peer-session template can also inherit attributes from another peer-session template (with locally defined attributes that override the attributes from an inherited peer-session).
- A *peer-policy* template defines the address-family dependent policy aspects for a peer including the inbound and outbound policy, filter-lists, and prefix-lists. A peer-policy template can inherit from a set of peer-policy templates. Cisco NX-OS evaluates these peer-policy templates in the order specified by the preference value in the inherit configuration. The lowest number is preferred over higher numbers.
- The *peer* template can inherit the peer-session and peer-policy templates to allow for simplified peer definitions. It is not mandatory to use a peer template but it can simplify the BGP configuration by providing reusable blocks of configuration.

Authentication

You can configure authentication for a BGP neighbor session. This authentication method adds an MD5 authentication digest to each TCP segment sent to the neighbor to protect BGP against unauthorized messages and TCP security attacks.

Note The MD5 password must be identical between BGP peers.

Route Policies and Resetting BGP Sessions

You can associate a route policy to a BGP peer. Route policies use route maps to control or modify the routes that BGP recognizes. You can configure a route policy for inbound or outbound route updates. The route policies can match on different criteria, such as a prefix or AS_path attribute, and selectively accept or deny the routes. Route policies can also modify the path attributes.

When you change a route policy applied to a BGP peer, you must reset the BGP sessions for that peer. Cisco NX-OS supports the following three mechanisms to reset BGP peering sessions:

- Hard reset—A hard reset tears down the specified peering sessions, including the TCP connection, and deletes routes coming from the specified peer. This option interrupts packet flow through the BGP network. Hard reset is disabled by default.
- Soft reconfiguration inbound—A soft reconfiguration inbound triggers routing updates for the specified peer without resetting the session. You can use this option if you change an inbound route policy. Soft reconfiguration inbound saves a copy of all routes received from the peer before processing the routes through the inbound route policy. If you change the inbound route policy, Cisco NX-OS passes these stored routes through the modified inbound route policy to update the route table without tearing down existing peering sessions. Soft reconfiguration inbound can use significant memory resources to store the unfiltered BGP routes. Soft reconfiguration inbound is disabled by default.
- Route Refresh—A route refresh updates the inbound routing tables dynamically by sending route refresh requests to supporting peers when you change an inbound route policy. The remote BGP peer responds with a new copy of its routes that the local BGP speaker processes with the modified route policy. Cisco NX-OS automatically sends an outbound route refresh of prefixes to the peer.
- BGP peers advertise the route refresh capability as part of the BGP capability negotiation when establishing the BGP peer session. Route refresh is the preferred option and enabled by default.

Note BGP also uses route maps for route redistribution, route aggregation, route dampening, and other features. See Chapter 14, “Configuring Route Policy Manager,” for more information on route maps.

eBGP

External BGP (eBGP) allows you to connect BGP peers from different autonomous systems to exchange routing updates. Connecting to external networks enables traffic from your network to be forwarded to other networks and across the Internet.

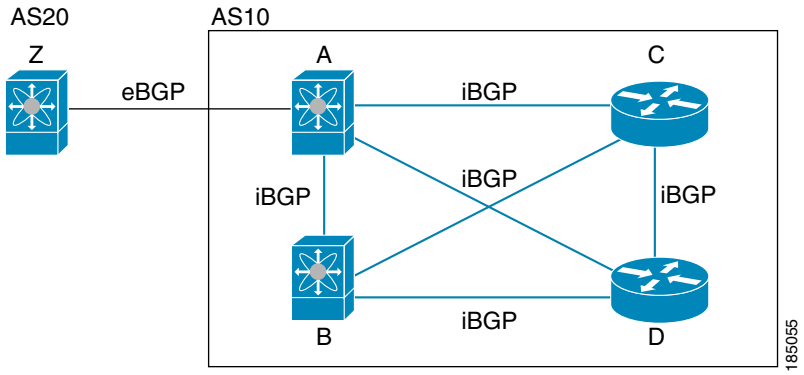
You should use loopback interfaces for establishing eBGP peering sessions because loopback interfaces are less susceptible to interface flapping. An interface *flap* occurs when the interface is administratively brought up or down because of a failure or maintenance issue. See the “BGP Additional Paths” section on page 9-24 for information on multihop, fast external failovers, and limiting the size of the AS-path attribute.

iBGP

Internal BGP (iBGP) allows you to connect BGP peers within the same autonomous system. You can use iBGP for multihomed BGP networks (networks that have more than one connection to the same external autonomous system).

Figure 9-1 shows an iBGP network within a larger BGP network.

Figure 9-1 iBGP Network



iBGP networks are fully meshed. Each iBGP peer has a direct connection to all other iBGP peers to prevent network loops.

Note You should configure a separate interior gateway protocol in the iBGP network.

This section includes the following topics:

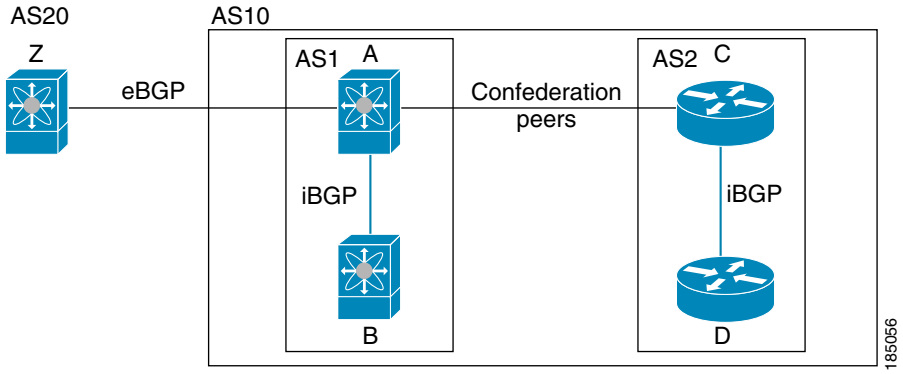
- AS Confederations, page 9-4
- Route Reflector, page 9-5

AS Confederations

A fully meshed iBGP network becomes complex as the number of iBGP peers grows. You can reduce the iBGP mesh by dividing the autonomous system into multiple subautonomous systems and grouping them into a single confederation. A confederation is a group of iBGP peers that use the same autonomous system number to communicate to external networks. Each subautonomous system is fully meshed within itself and has a few connections to other subautonomous systems in the same confederation.

Figure 9-2 shows the BGP network from Figure 9-1, split into two subautonomous systems and one confederation.

Figure 9-2 AS Confederation



In this example, AS10 is split into two subautonomous systems, AS1 and AS2. Each subautonomous system is fully meshed, but there is only one link between the subautonomous systems. By using AS confederations, you can reduce the number of links compared to the fully meshed autonomous system in Figure 9-1.

Route Reflector

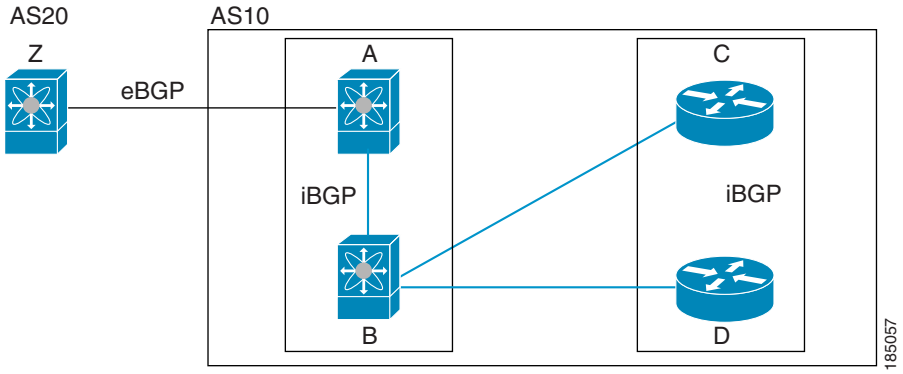
You can alternately reduce the iBGP mesh by using a route reflector configuration. Route reflectors pass learned routes to neighbors so that all iBGP peers do not need to be fully meshed.

Figure 9-1 shows a simple iBGP configuration with four meshed iBGP speakers (router A, B, C, and D). Without route reflectors, when router A receives a route from an external neighbor, it advertises the route to all three iBGP neighbors.

When you configure an iBGP peer to be a route reflector, it becomes responsible for passing iBGP learned routes to a set of iBGP neighbors.

In Figure 9-3, router B is the route reflector. When the route reflector receives routes advertised from router A, it advertises (reflects) the routes to routers C and D. Router A no longer has to advertise to both routers C and D.

Figure 9-3 Route Reflector



The route reflector and its client peers form a cluster. You do not have to configure all iBGP peers to act as client peers of the route reflector. You must configure any nonclient peer as fully meshed to guarantee that complete BGP updates reach all peers.

Capabilities Negotiation

A BGP speaker can learn about BGP extensions supported by a peer by using the capabilities negotiation feature. Capabilities negotiation allows BGP to use only the set of features supported by both BGP peers on a link.

If a BGP peer does not support capabilities negotiation, Cisco NX-OS will attempt a new session to the peer without capabilities negotiation if you have configured the address family as IPv4.

Route Dampening

Route dampening is a BGP feature that minimizes the propagation of flapping routes across an internetwork. A route flaps when it alternates between the available and unavailable states in rapid succession.

For example, consider a network with three BGP autonomous systems: AS1, AS2, and AS3. Suppose that a route in AS1 flaps (it becomes unavailable). Without route dampening, AS1 sends a withdraw message to AS2. AS2 propagates the withdrawal message to AS3. When the flapping route reappears, AS1 sends an advertisement message to AS2, which sends the advertisement to AS3. If the route repeatedly becomes unavailable, and then available, AS1 sends many withdrawal and advertisement messages that propagate through the other autonomous systems.

Route dampening can minimize flapping. Suppose that the route flaps. AS2 (in which route dampening is enabled) assigns the route a penalty of 1000. AS2 continues to advertise the status of the route to neighbors. Each time that the route flaps, AS2 adds to the penalty value. When the route flaps so often that the penalty exceeds a configurable suppression limit, AS2 stops advertising the route, regardless of how many times that it flaps. The route is now dampened.

The penalty placed on the route decays until the reuse limit is reached. At that time, AS2 advertises the route again. When the reuse limit is at 50 percent, AS2 removes the dampening information for the route.

Note The router does not apply a penalty to a resetting BGP peer when route dampening is enabled, even though the peer reset withdraws the route.

Load Sharing and Multipath

BGP can install multiple equal-cost eBGP or iBGP paths into the routing table to reach the same destination prefix. Traffic to the destination prefix is then shared across all the installed paths.

The BGP best-path algorithm considers the paths as equal-cost paths if the following attributes are identical:

- Weight
- Local preference
- AS_path
- Origin code
- Multi-exit discriminator (MED)
- IGP cost to the BGP next hop

BGP selects only one of these multiple paths as the best path and advertises the path to the BGP peers.

Note Paths received from different AS confederations are considered as equal-cost paths if the external AS_path values and the other attributes are identical.

Note When you configure a route reflector for iBGP multipath, and the route reflector advertises the selected best path to its peers, the next hop for the path is not modified.

Note Nexus OS performs BGP AS PATH check for both iBGP (VPNv4) and eBGP and if it finds its own AS in MP-BGP update, it discards the route. Use ALLOWAS-IN attribute for VPNv4 neighbors to resolve this issue.

BGP Additional Paths

In Cisco NX-OS releases prior to 6.1, only one BGP best path is advertised, and the BGP speaker accepts only one path for a given prefix from a given peer. If a BGP speaker receives multiple paths for the same prefix within the same session, it uses the most recent advertisement.

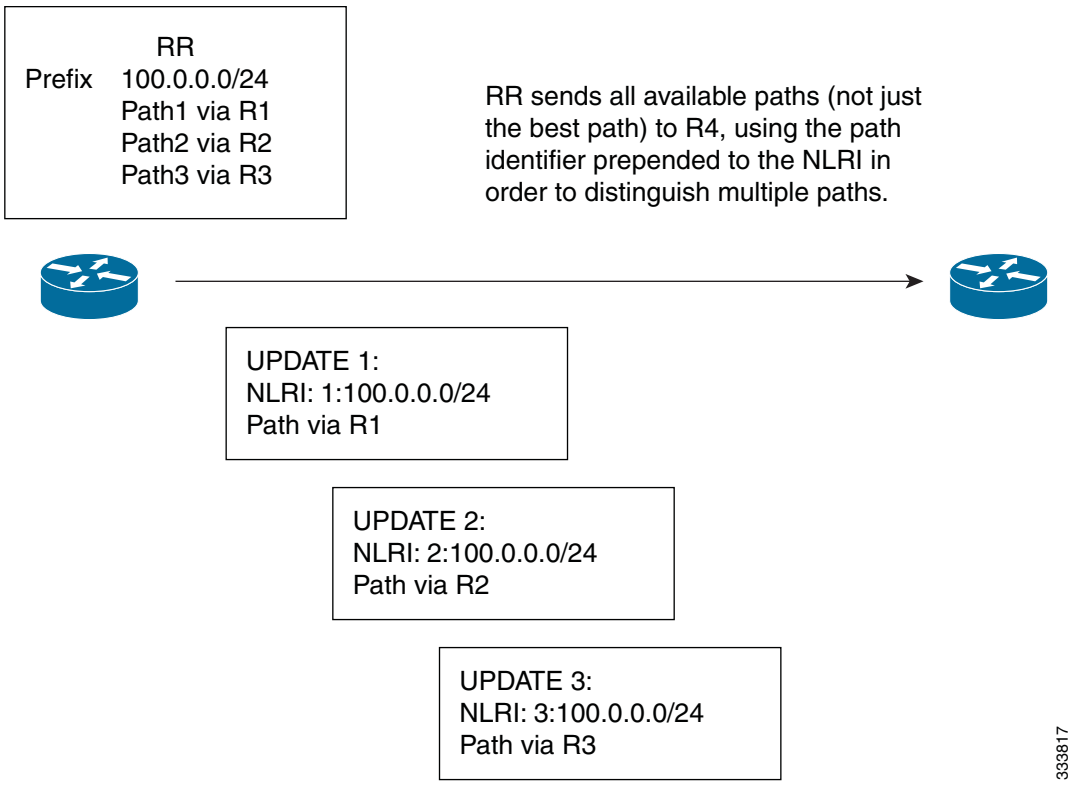
Beginning with Cisco NX-OS Release 6.1, BGP supports the additional paths feature, which allows the BGP speaker to propagate and accept multiple paths for the same prefix without the new paths replacing any previous ones. This feature allows BGP speaker peers to negotiate whether they support advertising and receiving multiple paths per prefix and advertising such paths. A special 4-byte path ID is added to the network layer reachability information (NLRI) to differentiate multiple paths for the same prefix sent across a peer session. The following figure illustrates the BGP additional paths capability.

Route Aggregation

You can configure aggregate addresses. Route aggregation simplifies route tables by replacing a number of more specific addresses with an address that represents all the specific addresses. For example, you can replace these three more specific addresses, 10.1.1.0/24, 10.1.2.0/24, and 10.1.3.0/24 with one aggregate address, 10.1.0.0/16.

Aggregate prefixes are present in the BGP route table so that fewer routes are advertised.

Figure 9-4 BGP Route Advertisement with the Additional Paths Capability



Note Cisco NX-OS does not support automatic route aggregation.

Route aggregation can lead to forwarding loops. To avoid this problem, when BGP generates an advertisement for an aggregate address, it automatically installs a summary discard route for that aggregate address in the local routing table. BGP sets the administrative distance of the summary discard to 220 and sets the route type to discard. BGP does not use discard routes for next-hop resolution.

BGP Conditional Advertisement

BGP conditional advertisement allows you to configure BGP to advertise or withdraw a route based on whether or not a prefix exists in the BGP table. This feature is useful, for example, in multihomed networks, in which you want BGP to advertise some prefixes to one of the providers only if information from the other provider is not present.

Consider an example network with three BGP autonomous systems: AS1, AS2, and AS3, where AS1 and AS3 connect to the Internet and to AS2. Without conditional advertisement, AS2 propagates all routes to both AS1 and AS3. With conditional advertisement, you can configure AS2 to advertise certain routes to AS3 only if routes from AS1 do not exist (if for example, the link to AS1 fails).

BGP conditional advertisement adds an exist or not-exist test to each route that matches the configured route map. See the "Configuring BGP Conditional Advertisement" section on page 9-36 for more information.

BGP Next-Hop Address Tracking

BGP monitors the next-hop address of installed routes to verify next-hop reachability and to select, install, and validate the BGP best path. BGP next-hop address tracking speeds up this next-hop reachability test by triggering the verification process when routes change in the RIB that may affect BGP next-hop reachability.

BGP receives notifications from the RIB when next-hop information changes (event-driven notifications). BGP is notified when any of the following events occurs:

- Next hop becomes unreachable.
- Next hop becomes reachable.
- Fully recursed IGP metric to the next hop changes.
- First hop IP address or first hop interface changes.
- Next hop becomes connected.
- Next hop becomes unconnected.
- Next hop becomes a local address.
- Next hop becomes a nonlocal address.

Note Reachability and recursed metric events trigger a best-path recalculation.

Event notifications from the RIB are classified as critical and noncritical. Notifications for critical and noncritical events are sent in separate batches. However, a noncritical event is sent with the critical events if the noncritical event is pending and there is a request to read the critical events.

- Critical events are related to the reachability (reachable and unreachable), connectivity (connected and unconnected), and locality (local and nonlocal) of the next hops. Notifications for these events are not delayed.
- Noncritical events include only the IGP metric changes.

See the "Configuring BGP Next-Hop Address Tracking" section on page 9-23 for more information.

Route Redistribution

You can configure BGP to redistribute static routes or routes from other protocols. You configure a route policy with the **redistribution to control which routes are passed into BGP**. A route policy allows you to filter routes based on attributes such as the destination, origination protocol, route type, route tag, and so on. See Chapter 14, "Configuring Route Policy Manager," for more information.Prior to Cisco NX-OS Release 5.2(1), when you redistribute BGP to IGP, iBGP is redistributed as well. To override this behavior, you must insert an additional deny statement into the route map. iBGP is not redistributed to IGP by default.

You can use route maps to override the default behavior, but be careful when doing so as incorrect use of route maps can result in network loops. The following example shows how to use route maps to change the default behavoir.

You can change the default behavoir by modifying the route map as follows:

```
route-map foo permit 10
   match route-type internal
router ospf 1
```

```
redistribute bgp 100 route-map foo
```

BFD

This feature supports bidirectional forwarding detection (BFD) for IPv4 only. BFD is a detection protocol designed to provide fast forwarding-path failure detection times. BFD provides subsecond failure detection between two adjacent devices and can be less CPU-intensive than protocol hello messages because some of the BFD load can be distributed onto the data plane on supported modules.

BFD for BGP is supported on eBGP peers and iBGP single-hop peers. Configure the update-source option in neighbor configuration mode for iBGP single-hop peers using BFD.

Note BFD is not supported on other iBGP peers or for multihop eBGP peers.

See the *Cisco Nexus 6000 Series NX-OS Interfaces Configuration Guide, Release 7.x* for more information.

Tuning BGP

You can modify the default behavior of BGP through BGP timers and by adjusting the best-path algorithm.

This section includes the following topics:

BGP Timers

BGP uses different types of timers for neighbor session and global protocol events. Each established session has a minimum of two timers for sending periodic keepalive messages and for timing out sessions when peer keepalives do not arrive within the expected time. In addition, there are other timers for handling specific features. Typically, you configure these timers in seconds. The timers include a random adjustment so that the same timers on different BGP peers trigger at different times.

Tuning the Best-Path Algorithm

You can modify the default behavior of the best-path algorithm through optional configuration parameters, including changing how the algorithm handles the MED attribute and the router ID.

Multiprotocol BGP

BGP on Cisco NX-OS supports multiple address families. Multiprotocol BGP (MP-BGP) carries different sets of routes depending on the address family. For example, BGP can carry one set of routes for IPv4 unicast routing, and one set of routes for IPv4 multicast routing. You can use MP-BGP for reverse-path forwarding (RPF) checks in IP multicast networks.

Note Because Multicast BGP does not propagate multicast state information, you need a multicast protocol, such as Protocol Independent Multicast (PIM).

Use the router address-family and neighbor address-family configuration modes to support multiprotocol BGP configurations. MP-BGP maintains separate RIBs for each configured address family, such as a unicast RIB and a multicast RIB for BGP.

A multiprotocol BGP network is backward compatible but BGP peers that do not support multiprotocol extensions cannot forward routing information, such as address family identifier information, that the multiprotocol extensions carry.

Low Memory Handling

BGP reacts to low memory for the following conditions:

- Minor alert—BGP does not establish any new eBGP peers. BGP continues to establish new iBGP peers and confederate peers. Established peers remain, but reset peers are not reestablished.
- Severe alert—BGP shuts down select established eBGP peers every two minutes until the memory alert becomes minor. For each eBGP peer, BGP calculates the ratio of total number of paths received to the number of paths selected as best paths. The peers with the highest ratio are selected to be shut down to reduce memory usage. You must clear a shutdown eBGP peer before you can bring the eBGP peer back up to avoid oscillation.

Note You can exempt important eBGP peers from this selection process.

- Critical alert—BGP gracefully shuts down all the established peers. You must clear a shutdown BGP peer before you can bring the BGP peer back up.

See the "Tuning BGP" section on page 9-40 for more information on how to exempt a BGP peer from shutdown due to a low memory condition.

Virtualization Support

Cisco NX-OS supports multiple instances of BGP that run on the same system.

Licensing Requirements for Advanced BGP

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	BGP requires an LAN Enterprise Services license. For a complete explanation of the Cisco NX-OS licensing scheme and how to obtain and apply licenses, see the *Cisco NX-OS Licensing Guide*. **Note** Make sure the LAN Base Services license is installed on the switch to enable Layer 3 interfaces.

Prerequisites for BGP

BGP has the following prerequisites:

- You must enable the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).
- You should have a valid router ID configured on the system.
- You must have an AS number, either assigned by a Regional Internet Registry (RIR) or locally administered.
- You must have reachability (such as an interior gateway protocol (IGP), a static route, or a direct connection) to the peer that you are trying to make a neighbor relationship with.
- You must explicitly configure an address family under a neighbor for the BGP session establishment.

Guidelines and Limitations for BGP

BGP has the following configuration guidelines and limitations:

- The dynamic AS number prefix peer configuration overrides the individual AS number configuration inherited from a BGP template.
- If you configure a dynamic AS number for prefix peers in an AS confederation, BGP establishes sessions with only the AS numbers in the local confederation.
- BGP sessions created through a dynamic AS number prefix peer ignore any configured eBGP multihop time-to-live (TTL) value or a disabled check for directly connected peers.
- Configure a router ID for BGP to avoid automatic router ID changes and session flaps.
- Use the maximum-prefix configuration option per peer to restrict the number of routes received and system resources used.
- Configure the update-source to establish a session with eBGP multihop sessions.
- Specify a BGP route map if you configure redistribution.
- Configure the BGP router ID within a VRF.
- Cisco NX-OS does not support multi-hop BFD. BFD for BGP has the following limitations:
  - BFD is supported only for BGP IPv4.
  - BFD is supported only for eBGP peers and iBGP single-hop peers.
  - To enable BFD for iBGP single-hop peers, you must configure the update-source option on the physical interface.
  - BFD is not supported for multi-hop iBGP peers and multi-hop eBGP peers.
- If you decrease the keepalive and hold timer values, the network might experience session flaps.

Default Settings

Table 9-1 lists the default settings for BGP parameters.

Table 9-1 Default BGP Parameters

Parameters	Default
BGP feature	disabled
keep alive interval	60 seconds
hold timer	180 seconds

Configuring Advanced BGP

This section describes how to configure advanced BGP and includes the following topics:

Note If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Configuring BGP Session Templates

You can use BGP session templates to simplify BGP configuration for multiple BGP peers with similar configuration needs. BGP templates allow you to reuse common configuration blocks. You configure BGP templates first, and then apply these templates to BGP peers.

With BGP session templates, you can configure session attributes such as inheritance, passwords, timers, and security.

A peer-session template can inherit from one other peer-session template. You can configure the second template to inherit from a third template. The first template also inherits this third template. This indirect inheritance can continue for up to seven peer-session templates.

Any attributes configured for the neighbor take priority over any attributes inherited by that neighbor from a BGP template.

BEFORE YOU BEGIN

Note Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).When editing a template, you can use the **no** form of a command at either the peer or template level to explicitly override a setting in a template. You must use the **default** form of the command to reset that attribute to the default state.

SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *autonomous-system-number*
3. **template peer-session** *template-name*
4. **password** *number password*
5. **timers** *keepalive hold*
6. **exit**
7. **neighbor** *ip-address* **remote-as** *as-number*
8. **inherit peer-session** *template-name*
9. (Optional) **description** *text*
10. (Optional) **show bgp peer-session** *template-name*
11. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example**: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	**router bgp** *autonomous-system-number* **Example**: switch(config)# router bgp 65536 switch(config-router)#	Enables BGP and assigns the autonomous system number to the local BGP speaker.
Step 3	**template peer-session** *template-name* **Example**: switch(config-router)# template peer-session BaseSession switch(config-router-stmp)#	Enters peer-session template configuration mode.
Step 4	**password** *number password* **Example**: switch(config-router-stmp)# password 0 test	(Optional) Adds the clear text password *test* to the neighbor. The password is stored and displayed in type 3 encrypted form (3DES).
Step 5	**timers** *keepalive hold* **Example**: switch(config-router-stmp)# timers 30 90	(Optional) Adds the BGP keepalive and holdtimer values to the peer-session template. The default keepalive interval is 60. The default hold time is 180.
Step 6	**exit** **Example**: switch(config-router-stmp)# exit switch(config-router)#	Exits peer-session template configuration mode.
Step 7	**neighbor** *ip-address* **remote-as** *as-number* **Example:** switch(config-router)# neighbor 192.168.1.2 remote-as 65536 switch(config-router-neighbor)#	Places the router in the neighbor configuration mode for BGP routing and configures the neighbor IP address.

Step 8	**inherit peer-session** *template-name*
	
	Example:
	switch(config-router-neighbor)# inherit peer-session BaseSession
	switch(config-router-neighbor)
		Applies a peer-session template to the peer.

Step 9	**description** *text*
	
	Example:
	switch(config-router-neighbor)# description Peer Router A
	switch(config-router-neighbor)
		(Optional) Adds a description for the neighbor.

	Command	Purpose
Step 10	**show bgp peer-session** *template-name* **Example:** switch(config-router-neighbor)# show bgp peer-session BaseSession	(Optional) Displays the peer-policy template.
Step 11	**copy running-config startup-config** **Example:** switch(config-router-neighbor)# copy running-config startup-config	(Optional) Saves this configuration change.

Use the **show bgp neighbor** command to see the template applied. See the *Cisco Nexus 6000 Series Command Reference, Cisco NX-OS Releases 7.x*, for details on all commands available in the template.

This example shows how to configure a BGP peer-session template and apply it to a BGP peer:

```
switch# configure terminal
switch(config)# router bgp 65536
switch(config-router)# template peer-session BaseSession
switch(config-router-stmp)# timers 30 90
switch(config-router-stmp)# exit
switch(config-router)# neighbor 192.168.1.2 remote-as 65536
switch(config-router-neighbor)# inherit peer-session BaseSession
switch(config-router-neighbor)# description Peer Router A
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor)# copy running-config startup-config
```

Configuring BGP Peer-Policy Templates

You can configure a peer-policy template to define attributes for a particular address family. You assign a preference to each peer-policy template and these templates are inherited in the order specified, for up to five peer-policy templates in a neighbor address family.

Cisco NX-OS evaluates multiple peer policies for an address family using the preference value. The lowest preference value is evaluated first. Any attributes configured for the neighbor take priority over any attributes inherited by that neighbor from a BGP template.

Peer-policy templates can configure address family-specific attributes such as AS-path filter lists, prefix lists, route reflection, and soft reconfiguration.

BEFORE YOU BEGIN

Note Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).When editing a template, you can use the **no** form of a command at either the peer or template level to explicitly override a setting in a template. You must use the default form of the command to reset that attribute to the default state.

SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *autonomous-system-number*

3. **template peer-policy** *template-name*
4. **advertise-active-only**
5. **maximum-prefix** *number*
6. **exit**
7. **neighbor** *ip-address* **remote-as** *as-number*
8. **address-family ipv4 {multicast | unicast}**
9. **inherit peer-policy** *template-name preference*
10. (Optional) **show bgp peer-policy** *template-name*
11. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example**: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	**router bgp** *autonomous-system-number* **Example**: switch(config)# router bgp 65536 switch(config-router)#	Enables BGP and assigns the autonomous system number to the local BGP speaker.
Step 3	**template peer-policy** *template-name* **Example**: switch(config-router)# template peer-policy BasePolicy switch(config-router-ptmp)#	Creates a peer-policy template.
Step 4	**advertise-active-only** **Example**: switch(config-router-ptmp)# advertise-active-only	(Optional) Advertises only active routes to the peer.
Step 5	**maximum-prefix** *number* **Example**: switch(config-router-ptmp)# maximum-prefix 20	(Optional) Sets the maximum number of prefixes allowed from this peer.
Step 6	**exit** **Example**: switch(config-router-ptmp)# exit switch(config-router)#	Exits peer-policy template configuration mode.
Step 7	**neighbor** *ip-address* **remote-as** *as-number* **Example:** switch(config-router)# neighbor 192.168.1.2 remote-as 65536 switch(config-router-neighbor)#	Places the router in neighbor configuration mode for BGP routing and configures the neighbor IP address.

	Command	Purpose
Step 8	**address-family ipv4** {**multicast** | **unicast**} **Example**: switch(config-router-neighbor)# address-family ipv4 unicast switch(config-router-neighbor-af)#	Enters global address family configuration mode for the IPv4 address family.
Step 9	**inherit peer-policy** *template-name preference* **Example**: switch(config-router-neighbor-af)# inherit peer-policy BasePolicy 1	Applies a peer-policy template to the peer address family configuration and assigns the preference value for this peer policy.
Step 10	**show bgp peer-policy** *template-name* **Example:** switch(config-router-neighbor-af)# show bgp peer-policy BasePolicy	(Optional) Displays the peer-policy template.
Step 11	**copy running-config startup-config** **Example:** switch(config-router-neighbor-af)# copy running-config startup-config	(Optional) Saves this configuration change.

Use the **show bgp neighbor** command to see the template applied. See the *Cisco Nexus 6000 Series Command Reference, Cisco NX-OS Releases 7.x*, for details on all commands available in the template.

This example shows how to configure a BGP peer-session template and apply it to a BGP peer:

```
switch# configure terminal
switch(config)# router bgp 65536
switch(config-router)# template peer-session BasePolicy
switch(config-router-ptmp)# maximum-prefix 20
switch(config-router-ptmp)# exit
switch(config-router)# neighbor 192.168.1.1 remote-as 65536
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)# inherit peer-policy BasePolicy
switch(config-router-neighbor-af)# copy running-config startup-config
```

Configuring BGP Peer Templates

You can configure BGP peer templates to combine session and policy attributes in one reusable configuration block. Peer templates can also inherit peer-session or peer-policy templates. Any attributes configured for the neighbor take priority over any attributes inherited by that neighbor from a BGP template. You configure only one peer template for a neighbor, but that peer template can inherit peer-session and peer-policy templates.

Peer templates support session and address family attributes, such as eBGP multihop time-to-live, maximum prefix, next-hop self, and timers.

BEFORE YOU BEGIN

Note Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).When editing a template, you can use the **no** form of a command at either the peer or template level to explicitly override a setting in a template. You must use the default form of the command to reset that attribute to the default state.

SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *autonomous-system-number*
3. **template peer** *template-name*
4. (Optional) **inherit peer-session** *template-name*
5. (Optional) **address-family** {**ipv4** | **ipv6**} {**multicast** | **unicast**}
6. (Optional) **inherit peer** *template-name*
7. **exit**
8. (Optional) **timers** *keepalive hold*
9. **exit**
10. **neighbor** *ip-address* **remote-as** *as-number*
11. **inherit peer** *template-name*
12. (Optional) **timers** *keepalive hold*
13. (Optional) **show bgp peer-template** *template-name*
14. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example**: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	**router bgp** *autonomous-system-number* **Example**: switch(config)# router bgp 65536	Enters BGP mode and assigns the autonomous system number to the local BGP speaker.
Step 3	**template peer** *template-name* **Example**: switch(config-router)# template peer BasePeer switch(config-router-neighbor)#	Enters peer template configuration mode.

	Command	Purpose
Step 4	**inherit peer-session** *template-name* **Example:** `switch(config-router-neighbor)# inherit peer-session BaseSession`	(Optional) Inherits a peer-session template in the peer template.

Step 5	**address-family ipv4**{**multicast** | **unicast**}
	
	Example:
	`switch(config-router-neighbor)# address-family ipv4 unicast`
	`switch(config-router-neighbor-af)#`
		(Optional) Configures the global address family configuration mode for the IPv4 or IPv6 address family.

Step 6	**inherit peer** *template-name* **Example:** `switch(config-router-neighbor-af)# inherit peer BasePolicy`	(Optional) Applies a peer template to the neighbor address family configuration.

Step 7	**exit**
	
	Example:
	`switch(config-router-neighbor-af)# exit`
	`switch(config-router-neighbor)#`
		Exits BGP neighbor address family configuration mode.

Step 8	**timers** *keepalive hold* **Example:** `switch(config-router-neighbor)# timers 45 100`	(Optional) Adds the BGP timer values to the peer. These values override the timer values in the peer-session template, BaseSession.

Step 9	**exit**
	
	Example:
	`switch(config-router-neighbor)# exit`
	`switch(config-router)#`
		Exits BGP peer template configuration mode.

Step 10	**neighbor** *ip-address* **remote-as** *as-number*
	
	Example:
	`switch(config-router)# neighbor 192.168.1.2 remote-as 65536`
	`switch(config-router-neighbor)#`
		Places the router in neighbor configuration mode for BGP routing and configures the neighbor IP address.

Step 11	**inherit peer** *template-name* **Example:** `switch(config-router-neighbor)# inherit peer BasePeer`	Inherits the peer template.
Step 12	**timers** *keepalive hold* **Example:** `switch(config-router-neighbor)# timers 60 120`	(Optional) Adds the BGP timer values to this neighbor. These values override the timer values in the peer template and the peer-session template.
Step 13	**show bgp peer-template** *template-name* **Example:** `switch(config-router-neighbor-af)# show bgp peer-template BasePeer`	(Optional) Displays the peer template.
Step 14	**copy running-config startup-config** **Example:** `switch(config-router-neighbor-af)# copy running-config startup-config`	(Optional) Saves this configuration change.

Use the **show bgp neighbor** command to see the template applied. See the *Cisco Nexus 6000 Series Command Reference, Cisco NX-OS Releases 7.x*, for details on all commands available in the template.

This example shows how to configure a BGP peer template and apply it to a BGP peer:

```
switch# configure terminal
switch(config)# router bgp 65536
switch(config-router)# template peer BasePeer
switch(config-router-neighbor)# inherit peer-session BaseSession
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)# inherit peer-policy BasePolicy 1
switch(config-router-neighbor-af)# exit
switch(config-router-neighbor)# exit
switch(config-router)# neighbor 192.168.1.2 remote-as 65536
switch(config-router-neighbor)# inherit peer BasePeer
switch(config-router-neighbor)# copy running-config startup-config
```

Configuring Prefix Peering

BGP supports the definition of a set of peers using a prefix for both IPv4. This feature allows you to not have to add each neighbor to the configuration.

When defining a prefix peering, you must specify the remote AS number with the prefix. BGP accepts any peer that connects from that prefix and autonomous system if the prefix peering does not exceed the configured maximum peers allowed.

When a BGP peer that is part of a prefix peering disconnects, Cisco NX-OS holds its peer structures for a defined prefix peer timeout value. An established peer can reset and reconnect without danger of being blocked because other peers have consumed all slots for that prefix peering.

To configure the BGP prefix peering timeout value, use the following command in router configuration mode:

Command	Purpose
timers prefix-peer-timeout *value* **Example**: `switch(config-router-neighbor)# timers prefix-peer-timeout 120`	Configures the timeout value for prefix peering. The range is from 0 to 1200 seconds. The default value is 30.

To configure the maximum number of peers, use the following command in neighbor configuration mode:

Command	Purpose
maximum-peers *value* **Example**: `switch(config-router-neighbor)# maximum-peers 120`	Configures the maximum number of peers for this prefix peering. The range is from 1 to 1000.

This example shows how to configure a prefix peering that accepts up to 10 peers:

```
switch(config)# router bgp 65536
switch(config-router)# timers prefix-peer-timeout 120
switch(config-router)# neighbor 10.100.200.0/24 remote-as 65536
```

```
switch(config-router-neighbor)# maximum-peers 10
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)#
```

Use the **show ip bgp neighbor** command to show the details of the configuration for that prefix peering with a list of the currently accepted instances and the counts of active, maximum concurrent, and total accepted peers.

Configuring BGP Authentication

You can configure BGP to authenticate route updates from peers using MD5 digests.

To configure BGP to use MD5 authentication, use the following command in neighbor configuration mode:

Command	Purpose
password [**0** | **3** | **7**] *string* **Example**: `switch(config-router-neighbor)# password BGPpassword`	Configures an MD5 password for BGP neighbor sessions.

Resetting a BGP Session

If you modify a route policy for BGP, you must reset the associated BGP peer sessions. If the BGP peers do not support route refresh, you can configure a soft reconfiguration for inbound policy changes. Cisco NX-OS automatically attempts a soft reset for the session.

To configure soft reconfiguration inbound, use the following command in neighbor address-family configuration mode:

Command	Purpose
soft-reconfiguration inbound **Example**: `switch(config-router-neighbor-af)# soft-reconfiguration inbound`	Enables soft reconfiguration to store the inbound BGP route updates. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.

To reset a BGP neighbor session, use the following command in any mode:

Command	Purpose
clear bgp ip {**unicast** | **multicast**} *ip-address* **soft** {**in** | **out**} **Example**: `switch# clear bgp ip unicast 192.0.2.1 soft in`	Resets the BGP session without tearing down the TCP session.

Modifying the Next-Hop Address

You can modify the next-hop address used in a route advertisement in the following ways:

- Disable the next-hop calculation and use the local BGP speaker address as the next-hop address.
- Set the next-hop address as a third-party address. Use this feature in situations where the original next-hop address is on the same subnet as the peer that the route is being sent to. Using this feature saves an extra hop during forwarding.

To modify the next-hop address, use the following parameters in commands address-family configuration mode:

Command	Purpose
next-hop-self **Example**: `switch(config-router-neighbor-af)# next-hop-self`	Uses the local BGP speaker address as the next-hop address in route updates. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.
next-hop-third-party **Example**: `switch(config-router-neighbor-af)# next-hop-third-party`	Sets the next-hop address as a third-party address. Use this command for single-hop EBGP peers that do not have **next-hop-self** configured.

Configuring BGP Next-Hop Address Tracking

BGP next-hop address tracking is enabled by default and cannot be disabled.

You can modify the delay interval between RIB checks to increase the performance of BGP next-hop tracking. You can configure the critical timer for routes that affect BGP next-hop reachability, and you can configure the noncritical timer for all other routes in the BGP table.

To modify the BGP next-hop address tracking, use the following commands address-family configuration mode:

Command	Purpose
nexthop trigger-delay {**critical** | **non-critical**} *milliseconds* **Example**: `switch(config-router-af)# nexthop trigger-delay critical 5000`	Specifies the next-hop address tracking delay timer for critical next-hop reachability routes and for noncritical routes. The range is from 1 to 4294967295 milliseconds. The critical timer default is 3000. The noncritical timer default is 10000.
nexthop route-map *name* **Example**: `switch(config-router-af)# nexthop route-map nextHopLimits`	Specifies a route map to match the BGP next-hop addresses to. The name can be any case-sensitive, alphanumeric string up to 63 characters.

Configuring Next-Hop Filtering

BGP next-hop filtering allows you to specify that when a next-hop address is checked with the RIB, the underlying route for that next-hop address is passed through the route map. If the route map rejects the route, the next-hop address is treated as unreachable.

BGP marks all next hops that are rejected by the route policy as invalid and does not calculate the best path for the routes that use the invalid next-hop address.

To configure BGP next-hop filtering, use the following command in address-family configuration mode:

Command	Purpose
nexthop route-map *name* **Example:** `switch(config-router-af)# nexthop route-map nextHopLimits`	Specifies a route map to match the BGP next-hop route to. The name can be any case-sensitive, alphanumeric string up to 63 characters.

Disabling Capabilities Negotiation

You can disable capabilities negotiations to interoperate with older BGP peers that do not support capabilities negotiation.

To disable capabilities negotiation, use the following command in neighbor configuration mode:

Command	Purpose
dont-capability-negotiate **Example:** `switch(config-router-neighbor)# dont-capability-negotiate`	Disables capabilities negotiation. You must manually reset the BGP sessions after configuring this command.

BGP Additional Paths

BGP supports sending and receiving multiple paths per prefix and advertising such paths.

Configuring Sending and Receiving of Additional Paths, page 9-24

Advertising the Capability of Sending and Receiving Additional Paths, page 9-26

Configuring Advertised Paths, page 9-27

Configuring Additional Path Selection, page 9-28

Configuring Sending and Receiving of Additional Paths

You can configure the capability of sending and receiving additional paths to and from the BGP peers.

Procedure

	Command	Purpose
Step 1	**configure terminal** **Example**: switch# **configure terminal** switch(config)#	Enters Global Configuration Mode.
Step 2	**router bgp** *number* **Example**: switch(config)# **router bgp 1**	Enters the router BGP configuration mode.
Step 3	**address-family ipv4 unicast** **Example**: switch(config-router)# **address-family ipv4 unicast**	Enters the address family configuration mode.
Step 4	**additional-paths send** **Example**: switch(config-router-af)# **additional-paths send**	Enables the send capability of additional paths for all of the neighbors under address family.
Step 5	**[no] additional-paths send** **Example**: switch(config-router-af)# **additional-paths send**	Enables the send capability of additional paths for all of the neighbors under address family. The **no** form of this command disables the send capability.
Step 6	**[no] additional-paths receive [disable]** **Example**: **s**witch(config-router-af)**#** **additional-paths receive [disable]**	Enables the receive capability of additional paths for all of the neighbors under address family, for which the capability has not been disabled. The **no** form of this command disables the capability to receive additional paths from the peer.
Step 7	**show bgp neighbor** **Example**: switch(config)# **show bgp neighbor**	Displays the advertised additional paths send or receive capability to the remote peer.
Step 8	**copy running-config startup-config** **Example**: switch(config)# **copy running-config startup-config**	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to enable the additional paths send and receive capability for neighbors under the specified address family for which this capability has not been disabled:

```
switch(config)# router bgp 100
switch(config-router)# neighbor 10.131.31.2 remote-as 100
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)# additional-paths send
switch(config-router-neighbor-af)# additional-paths receive
switch(config)# show bgp neighbor
```

```
switch(config)# copy running-config startup-config
```

Advertising the Capability of Sending and Receiving Additional Paths

You can configure BGP to advertise the capability of sending and receiving additional paths to and from the BGP peers.

Procedure

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# **configure terminal** switch(config)#	Enters Global Configuration Mode.
Step 2	**router bgp** *number* **Example:** switch(config)# **router bgp 100**	Enters the router BGP configuration mode.
Step 3	**neighbor** *IP-address* **remote-as** *number* **Example:** switch(config-router)# **neighbor 10.131.31.2 remote-as 100**	Configures a BGP neighbor and enters the neighbor configuration mode.
Step 4	**address-family ipv4 unicast** **Example:** switch(config-router-neighbor)# **address-family ipv4 unicast**	Enters the address family configuration mode.
Step 5	**[no] capability additional paths send [disable]** **Example:** switch(config-router-neighbor-af)# **capability additional paths send [disable]**	Advertises the capability to send additional paths to the BGP peer. The **disable** option disables the advertising capability of sending additional paths. The **no** form of this command disables the capability of sending additional paths.
Step 6	**[no] capability additional paths receive [disable]** **Example:** switch (config-router-neighbor-af)# **capability additional paths receive [disable]**	Advertises the capability to receive additional paths to the BGP peer. The disable option disables the advertising capability of receiving additional paths. The **no** form of this command disables the capability of receiving additional paths.

	Command	Purpose
Step 7	**show bgp neighbor** **Example**: Switch(config)# **show bgp neighbor**	Displays the advertised additional paths send or receive capability to the remote peer.
Step 8	**copy running-config startup-config** **Example**: switch(config)# **copy running-config startup-config**	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to advertise the capability to send and receive additional paths to the BGP peer:

```
switch(config)# router bgp 100
switch(config-router)# neighbor 10.131.31.2 remote-as 100
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)# capability additional-paths send
switch(config-router-neighbor-af)# capability additional-paths receive
switch(config)# show bgp neighbor
switch(config)# copy running-config startup-config
```

Configuring Advertised Paths

You can specify the paths that are advertised for BGP.

Procedure

	Command	Purpose
Step 1	**configure terminal** **Example**: switch# **configure terminal** switch(config)#	Enters Global Configuration Mode.
Step 2	**route-map path-selection rmap** **Example**: switch(config)# **route-map path-selection rmap**	Enters the route-map path-selection configuration mode.
Step 3	**[no]set path-selection all advertise** **Example**: switch(config-route-map)# **set path-selection all advertise**	Specifies the paths to be advertised for a given prefix. The **no** form of this command specifies that only the best path be advertised.

	Command	Purpose
Step 4	**show bgp neighbor{ipv4 | ipv6} unicastip-address | ipv6-prefix [vrfvrf-name]** **Example:** switch(config)# **show bgp neighbor{ipv4 | ipv6} unicastip-address | ipv6-prefix [vrfvrf-name]**	It displays the BGP neighbor information.
Step 5	**copy running-config startup-config** **Example:** switch(config)# **copy running-config startup-config**	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to specify the paths to be advertised for the specified prefix:

```
switch(config)# route-map PATH_SELECTION_RMAP
switch(config-route-map)# match ip address prefix-list pl
switch(config)# show bgp ip4 unicast
switch(config)# copy running-config startup-config
```

Configuring Additional Path Selection

You can configure the capability of selecting additional paths for a prefix.

Procedure

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# **configure terminal** switch(config)#	Enters Global Configuration Mode.
Step 2	**router bgp** *number* **Example:** switch(config)# **router bgp 100**	Enters the router BGP configuration mode.
Step 3	**address-family {ipv4 | ipv6} unicast** **Example:** switch(config-router)# **address-family {ipv4 | ipv6} unicast**	Enters the address family configuration mode.

	Command	Purpose
Step 4	**[no] additional-paths selection route-map *map-name*** **Example:** switch(config-router-af)# **additional-paths selection route-map *map-name***	Configures the capability of sending and receiving additional paths to and from the BGP peers. The no form of this command specifies that only the best path be advertised.
Step 5	**show bgp {ipv4 | ipv6} unicast[*ip-address* | ipv6-prefix] [vrf *vrf-name*]** **Example:** switch(config)**# show bgp {ipv4 | ipv6} unicast[ip-address | ipv6-prefix] [vrf vrf-name]**	Displays the local peer has advertised the additional paths send or receive capability to the remote peer.
Step 6	**copy running-config startup-config** **Example:** switch(config)# **copy running-config startup-config**	(Optional) Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to specify that all paths be advertised for the specified prefix:

```
switch(config)# router bgp 100
switch(config-router)# address-family ipv4 unicast
switch(config-router-af)# additional-paths selection route-map PATH_SELECTION_RMAP
switch(config)# copy running-config startup-config
```

Configuring eBGP

This section includes the following topics:

Disabling eBGP Single-Hop Checking

You can configure eBGP to disable checking whether a single-hop eBGP peer is directly connected to the local router. Use this option for configuring a single-hop loopback eBGP session between directly connected switches.

To disable checking whether or not a single-hop eBGP peer is directly connected, use the following command in neighbor configuration mode:

Command	Purpose
disable-connected-check **Example:** `switch(config-router-neighbor)# disable-connected-check`	Disables checking whether or not a single-hop eBGP peer is directly connected. You must manually reset the BGP sessions after using this command.

Configuring eBGP Multihop

You can configure the eBGP time-to-live (TTL) value to support eBGP multihop. In some situations, an eBGP peer is not directly connected to another eBGP peer and requires multiple hops to reach the remote eBGP peer. You can configure the eBGP TTL value for a neighbor session to allow these multihop sessions.

To configure eBGP multihop, use the following command in neighbor configuration mode:

Command	Purpose
ebgp-multihop *ttl-value* **Example:** `switch(config-router-neighbor)# ebgp-multihop 5`	Configures the eBGP TTL value for eBGP multihop. The range is from 2 to 255. You must manually reset the BGP sessions after using this command.

Disabling a Fast External Failover

Typically, when a BGP router loses connectivity to a directly connected eBGP peer, BGP triggers a fast external failover by resetting the eBGP session to the peer. You can disable this fast external failover to limit the instability caused by link flaps.

To disable fast external failover, use the following command in router configuration mode:

Command	Purpose
no fast-external-failover **Example:** `switch(config-router)# no fast-external-failover`	Disables a fast external failover for eBGP peers. This command is enabled by default.

Configuring Local AS Support

The local AS feature allows a router to appear to be a member of a second autonomous system (AS), in addition to its real AS. Local AS allows two ISPs to merge without modifying peering arrangements. Routers in the merged ISP become members of the new autonomous system but continue to use their old AS numbers for their customers.

This feature can only be used for true eBGP peers. You cannot use this feature for two peers that are members of different confederation sub-autonomous systems.

To configure eBGP local AS support, use the following command in neighbor configuration mode:

Command	Purpose
local-as *number* **[no-prepend [replace-as [dual-as]]]** **Example**: `switch(config-router-neighbor)# local-as 1.1`	Configures eBGP to prepend the local AS *number* to the AS_PATH attribute.The AS *number* can be a 16-bit integer or a 32-bit integer in the form of a higher 16-bit decimal number and a lower 16-bit decimal number in xx.xx format.

This example shows how to configure local AS support on a VRF:

```
switch(config)# router bgp 1
switch(config-router)# vrf test
switch(config-router-vrf)# local-as 1
switch(config-router-vrf)# show running-config bgp
```

Limiting the AS-path Attribute

You can configure eBGP to discard routes that have a high number of AS numbers in the AS-path attribute.

To discard routes that have a high number of AS numbers in the AS-path attribute, use the following command in router configuration mode:

Command	Purpose
maxas-limit *number* **Example**: `switch(config-router)# maxas-limit 50`	Discards eBGP routes that have a number of AS-path segments that exceed the specified limit. The range is from 1 to 2000.

Configuring the General Time-To-Live Security Mechanism

The General Time-To-Live Security Mechanism (GTSM) protects eBGP peering sessions from CPU utilization-based attacks. GTSM checks the time-to-live (TTL) value of incoming eBGP packets and discards forged BGP packets in the hardware.

When you enable GTSM for a peer, Cisco NX-OS sends out BGP packets to the peer with a TTL value of 255. For packets received from the peer, Cisco NX-OS verifies that the TTL value is greater than or equal to the configured incoming TTL value. If this check fails, Cisco NX-OS discards the packets in the hardware. The incoming TTL value is derived from the hop count configured for the peer. If the peer is just one hop away (single-hop eBGP), the incoming TTL value is expected to be 255. If the eBGP peer is multiple hops away, then the incoming TTL value is calculated to be (255–hop count). The configured hop count should be the maximum for all possible paths between the two peers.

Note GTSM is applicable only to eBGP peers and is disabled by default. You can enable GTSM on a per-peer or a per-peer-template basis.

Note You cannot configure GTSM if you use the **ebgp-multihop** command. Also, you cannot configure GTSM with a hop count of two or more, if the **disable-connected-check** command is configured.

Configuring AS Confederations

To configure an AS confederation, you must specify a confederation identifier. The group of autonomous systems within the AS confederation looks like a single autonomous system with the confederation identifier as the autonomous system number.

To configure a BGP confederation identifier, use the following command in router configuration mode:

Command	Purpose
confederation identifier *as-number* **Example:** `switch(config-router)# confederation identifier 4000`	Configures a confederation identifier for an AS confederation. This command triggers an automatic notification and session reset for the BGP neighbor sessions.

To configure the autonomous systems that belong to the AS confederation, use the following command in router configuration mode:

Command	Purpose
bgp confederation peers *as-number* [*as-number2...*] **Example:** `switch(config-router)# bgp confederation peers 5 33 44`	Specifies a list of autonomous systems that belong to the confederation. This command triggers an automatic notification and session reset for the BGP neighbor sessions.

Configuring Route Reflector

You can configure iBGP peers as route reflector clients to the local BGP speaker, which acts as the route reflector. Together, a route reflector and its clients form a cluster. A cluster of clients usually has a single route reflector. In such instances, the cluster is identified by the router ID of the route reflector. To increase redundancy and avoid a single point of failure in the network, you can configure a cluster with more than one route reflector. You must configure all route reflectors in the cluster with the same 4-byte cluster ID so that a route reflector can recognize updates from route reflectors in the same cluster.

BEFORE YOU BEGIN

Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).

SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *as-number*
3. **cluster-id** *cluster-id*
4. **address-family ipv4** {**unicast** | **multicast**}
5. (Optional) **client-to-client reflection**
6. **exit**

7. **neighbor** *ip-address* **remote-as** *as-number*
8. **address-family ipv4** {**unicast** | **multicast**}
9. **route-reflector-client**
10. **show bgp ip** {**unicast** | **multicast**} **neighbors**
11. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router bgp** *as-number*
	
	Example:
	`switch(config)# router bgp 65536`
	`switch(config-router)#`
		Enters BGP mode and assigns the autonomous system number to the local BGP speaker.

Step 3	**cluster-id** *cluster-id* **Example**: `switch(config-router)# cluster-id 192.0.2.1`	Configures the local router as one of the route reflectors that serve the cluster. You specify a cluster ID to identify the cluster. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.

Step 4	**address-family ipv4** {**unicast** | **multicast**}
	
	Example:
	`switch(config-router)# address-family ipv4 unicast`
	`switch(config-router-af)#`
		Enters router address family configuration mode for the specified address family.

Step 5	**client-to-client reflection** **Example**: `switch(config-router-af)# client-to-client reflection`	(Optional) Configures client-to-client route reflection. This feature is enabled by default. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.

Step 6	**exit**
	
	Example:
	`switch(config-router-neighbor)# exit`
	`switch(config-router)#`
		Exits router address configuration mode.

Step 7	**neighbor** *ip-address* **remote-as** *as-number*
	
	Example:
	`switch(config-router)# neighbor 192.0.2.10 remote-as 65536`
	`switch(config-router-neighbor)#`
		Configures the IP address and AS number for a remote BGP peer.

	Command or Action	Purpose

Step 8	**address-family ipv4** {**unicast** | **multicast**}
	
	Example:
	`switch(config-router-neighbor)# address-family ipv4 unicast`
	`switch(config-router-neighbor-af)#`
		Enters neighbor address family configuration mode for the unicast IPv4 or IPv6 address family.

Step 9	**route-reflector-client** **Example**: `switch(config-router-neighbor-af)# route-reflector-client`	Configures the switch as a BGP route reflector and configures the neighbor as its client. This command triggers an automatic notification and session reset for the BGP neighbor sessions.
Step 10	**show bgp ip** {**unicast** | **multicast**} **neighbors** **Example:** `switch(config-router-neighbor-af)# show bgp ip unicast neighbors`	(Optional) Displays the BGP peers.
Step 11	**copy running-config startup-config** **Example:** `switch(config-router-neighbor-af)# copy running-config startup-config`	(Optional) Saves this configuration change.

This example shows how to configure the router as a route reflector and add one neighbor as a client:

```
switch(config)# router bgp 65536
switch(config-router)# neighbor 192.0.2.10 remote-as 65536
switch(config-router-neighbor)# address-family ip unicast
switch(config-router-neighbor-af)# route-reflector-client
switch(config-router-neighbor-af)# copy running-config startup-config
```

Configuring Route Dampening

You can configure route dampening to minimize route flaps propagating through your iBGP network.

To configure route dampening, use the following command in address-family or VRF address family configuration mode:

Command	Purpose
dampening [{*half-life reuse-limit suppress-limit max-suppress-time* | **route-map** *map-name*}] **Example**: `switch(config-router-af)# dampening route-map bgpDamp`	Disables capabilities negotiation. The parameter values are as follows: • half-life—The range is from 1 to 45. • reuse-limit—The range is from 1 to 20000. • suppress-limit—The range is from 1 to 20000. • max-suppress-time—The range is from 1 to 255.

Configuring Load Sharing and ECMP

You can configure the maximum number of paths that BGP adds to the route table for equal-cost multipath load balancing.

To configure the maximum number of paths, use the following command in router address-family configuration mode:

Command	Purpose
maximum-paths [**ibgp**] *maxpaths* **Example**: `switch(config-router-af)# maximum-paths 12`	Configures the maximum number of equal-cost paths for load sharing. The range is from 1 to 64. The default is 8.

Configuring Maximum Prefixes

You can configure the maximum number of prefixes that BGP can receive from a BGP peer. If the number of prefixes exceeds this value, you can optionally configure BGP to generate a warning message or tear down the BGP session to the peer.

To configure the maximum allowed prefixes for a BGP peer, use the following command in neighbor address-family configuration mode:

Command	Purpose
maximum-prefix *maximum* [*threshold*] [**restart** *time* | **warming-only**] **Example**: `switch(config-router-neighbor-af)# maximum-prefix 12`	Configures the maximum number of prefixes from a peer. The parameter ranges are as follows: • *maximum*—The range is from 1 to 300000. • *Threshold*—The range is from 1 to 100 percent. The default is 75 percent. • *time*—The range is from 1 to 65535 minutes. This command triggers an automatic notification and session reset for the BGP neighbor sessions if the prefix limit is exceeded.

Configuring Dynamic Peer Prioritization

You can configure dynamic peer prioritization to protect BGP sessions from CPU utilization-based denial-of-service (DoS) attacks. You use dynamic peer prioritization to dynamically configure hardware packet filters to prioritize packets from configured and established peers that are bound to the supervisor and to discard packets from unknown senders.

To configure dynamic peer prioritization, use the following command in router configuration mode:

Command	Purpose
dynamic-prioritization bgp **Example**: `switch(config)# dynamic-prioritization bgp`	Enables dynamic peer prioritization. Enabled by default.

Configuring Dynamic Capability

You can configure dynamic capability for a BGP peer.

To configure dynamic capability, use the following command in neighbor configuration mode:

Command	Purpose
dynamic-capability **Example**: `switch(config-router-neighbor)# dynamic-capability`	Enables dynamic capability. This command triggers an automatic notification and session reset for the BGP neighbor sessions. This command is disabled by default.

Configuring Aggregate Addresses

You can configure aggregate address entries in the BGP route table.

To configure an aggregate address, use the following command in router address-family configuration mode:

Command	Purpose
aggregate-address *ip-prefix/length* [**as-set**] [**summary-only**] [**advertise-map** *map-name*] [**attribute-map** *map-name*] [*suppress*-**map** *map-name*] **Example**: `switch(config-router-af)# aggregate-address 192.0.2.0/8 as-set`	Creates an aggregate address. The path advertised for this route is an autonomous system set that consists of all elements contained in all paths that are being summarized: • The **as-set** keyword generates autonomous system set path information and community information from contributing paths. • The **summary-only** keyword filters all more specific routes from updates. • The **advertise-map** keyword and argument specify the route map used to select attribute information from selected routes. • The **attribute-map** keyword and argument specify the route map used to select attribute information from the aggregate. • The **suppress-map** keyword and argument conditionally filters more specific routes.

Configuring BGP Conditional Advertisement

You can configure BGP conditional advertisement to limit the routes that BGP propagates. You define the following two route maps:

- Advertise map—Specifies the conditions that the route must match before BGP considers the conditional advertisement. This route map can contain any appropriate match statements.

- Exist map or nonexist map—Defines the prefix that must exist in the BGP table before BGP propagates a route that matches the advertise map. The nonexist map defines the prefix that must not exist in the BGP table before BGP propagates a route that matches the advertise map. BGP processes only the permit statements in the prefix list match statements in these route maps.

If the route does not pass the condition, BGP withdraws the route if it exists in the BGP table.

BEFORE YOU BEGIN

Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).

SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *as-number*
3. **neighbor** *ipaddress* **remote-as** *as-number*
4. **address-family ipv4** {**unicast** | **multicast**}
5. **advertise-map** *adv-map* {**exist-map** *exist-rmap* | **non-exist-map** *nonexist-rmap*}
6. (Optional) **show ip bgp neighbor**
7. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router bgp** *as-number*
	
	Example:
	`switch(config)# router bgp 65536`
	`switch(config-router)#`
		Enters BGP mode and assigns the autonomous system number to the local BGP speaker.

Step 3	**neighbor** *ip-address* **remote-as** *as-number*
	
	Example:
	`switch(config-router)# neighbor 192.168.1.2 remote-as 65537`
	`switch(config-router-neighbor)#`
		Places the router in neighbor configuration mode for BGP routing and configures the neighbor IP address.

Step 4	**address-family ipv4** {**unicast** | **multicast**}
	
	Example:
	`switch(config-router-neighbor)# address-family ipv4 multicast`
	`switch(config-router-neighbor-af)#`
		Enters address family configuration mode.

	Command	Purpose
Step 5	**advertise-map** *adv-map* {**exist-map** *exist-rmap* | **non-exist-map** *nonexist-rmap*} **Example**: `switch(config-router-neighbor-af)# advertise-map advertise exist-map exist`	Configures BGP to conditionally advertise routes based on the two configured route maps: • *adv-map—Specifies a route map with* **match** *statements that the route must pass before BGP passes the route to the next route map. The adv-map is a case-sensitive, alphanumeric string up to 63 characters.* • *exist-rmap—Specifies a route map with* match *statements for a prefix list. A prefix in the BGP table must match a prefix in the prefix list before BGP will advertise the route. The exist-rmap is a case-sensitive, alphanumeric string up to 63 characters.* • *nonexist-rmap—Specifies a route map with* match *statements for a prefix list. A prefix in the BGP table must not match a prefix in the prefix list before BGP will advertise the route. The nonexist-rmap is a case-sensitive, alphanumeric string up to 63 characters.*
Step 6	**show ip bgp neighbor** **Example:** `switch(config-router-neighbor-af)# show ip bgp neighbor`	(Optional) Displays information about BGP and the configured conditional advertisement route maps.
Step 7	**copy running-config startup-config** **Example:** `switch(config-router-neighbor-af)# copy running-config startup-config`	(Optional) Saves this configuration change.

This example shows how to configure BGP conditional advertisement:

```
switch# configure terminal
switch(config)# router bgp 65536
switch(config-router)# neighbor 192.0.2.2 remote-as 65537
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)# advertise-map advertise exist-map exist
switch(config-router-neighbor-af)# exit
switch(config-router-neighbor)# exit
switch(config-router)# exit
switch(config)# route-map advertise
switch(config-route-map)# match as-path pathList
switch(config-route-map)# exit
switch(config)# route-map exit
switch(config-route-map)# match ip address prefix-list plist
switch(config-route-map)# exit
switch(config)# ip prefix-list plist permit 209.165.201.0/27
```

Configuring Route Redistribution

You can configure BGP to accept routing information from another routing protocol and redistribute that information through the BGP network. Optionally, you can assign a default route for redistributed routes.

Note Redistribution does not work if the access list is used as a **match** option in **route-maps.**

BEFORE YOU BEGIN

Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).

SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *as-number*
3. **address-family ipv4** {**unicast** | **multicast**}
4. **redistribute** {**direct** | {**eigrp** | **ospf** | **ospfv3** | **rip**} *instance-tag* | **static**} **route-map** *map-name*
5. (Optional) **default-metric** *value*
6. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	**router bgp** *as-number* Example: switch(config)# router bgp 65536 switch(config-router)#	Enters BGP mode and assigns the autonomous system number to the local BGP speaker.
Step 3	**address-family ipv4** {**unicast** | **multicast**} **Example**: switch(config-router)# address-family ipv4 unicast switch(config-router-af)#	Enters address family configuration mode.
Step 4	**redistribute** {**direct** | {**eigrp** | **ospf** | **ospfv3** | **rip**} *instance-tag* | **static**} **route-map** *map-name* **Example**: switch(config-router-af)# redistribute eigrp 201 route-map Eigrpmap	Redistributes routes from other protocols into BGP. See the "Configuring Route Maps" section on page 14-13 for more information about route maps.

	Command	Purpose
Step 5	**default-metric** *value* **Example**: switch(config-router-af)# default-metric 33	(Optional) Generates a default route into BGP.
Step 6	**copy running-config startup-config** **Example:** switch(config-router-af)# copy running-config startup-config	(Optional) Saves this configuration change.

This example shows how to redistribute EIGRP into BGP:

```
switch# configure terminal
switch(config)# router bgp 65536
switch(config-router)# address-family ipv4 unicast
switch(config-router-af)# redistribute eigrp 201 route-map Eigrpmap
switch(config-router-af)# copy running-config startup-config
```

Tuning BGP

You can tune BGP characteristics through a series of optional parameters.

To tune BGB, use the following optional commands in router configuration mode:

Command	Purpose
bestpath [**always-compare-med** | **compare-routerid** | **med** {**missing-as-worst** | **non-deterministic**}] **Example**: switch(config-router)# bestpath always-compare-med	Modifies the best-path algorithm. The optional parameters are as follows: • **always-compare-med**—Compares MED on paths from different autonomous systems. • **compare-routerid**—Compares the router IDs for identical eBGP paths. • **med missing-as-worst**— Sees a missing MED as the highest MED. • **med non-deterministic**—Does not always select the best MED path from among the paths from the same autonomous system.
enforce-first-as **Example:** switch(config-router)# enforce-first-as	Enforces the neighbor autonomous system to be the first AS number listed in the AS_path attribute for eBGP.
log-neighbor-changes **Example**: switch(config-router)# log-neighbor-changes	Generates a system message when a neighbor changes state.

Command	Purpose
router-id *id* **Example**: `switch(config-router)# router-id 209.165.20.1`	Manually configures the router ID for this BGP speaker.
timers [**bestpath-delay** *delay* | **bgp** *keepalive holdtime* | **prefix-peer-timeout** *timeout*] **Example**: `switch(config-router)# timers bgp 90 270`	Sets the BGP timer values. The optional parameters are as follows: • *delay*—Initial best-path timeout value after a restart. The range is from 0 to 3600 seconds. The default value is 300. • keepalive—BGP session keepalive time. The range is from 0 to 3600 seconds. The default value is 60. • holdtime—BGP session hold time.The range is from 0 to 3600 seconds. The default value is 180. • timeout—Prefix peer timeout value. The range is from 0 to 1200 seconds. The default value is 30. You must manually reset the BGP sessions after configuring this command.

To tune BGP, use the following optional command in router address-family configuration mode:

Command	Purpose
distance *ebgp-distance ibgp distance local-distance* **Example**: `switch(config-router-af)# distance 20 100 200`	Sets the administrative distance for BGP. The range is from 1 to 255. The defaults are as follows: • eBGP distance—20. • iBGP distance—200. • local distance—220. Local distance is the administrative distance used for aggregate discard routes when they are installed in the RIB.

To tune BGP, use the following optional commands in neighbor configuration mode:

Command	Purpose
description *string* **Example**: `switch(config-router-neighbor)# description main site`	Sets a descriptive string for this BGP peer. The string can be up to 80 alphanumeric characters.
low-memory exempt **Example**: `switch(config-router-neighbor)# low-memory exempt`	Exempts this BGP neighbor from a possible shutdown due to a low memory condition.
transport connection-mode passive **Example:** `switch(config-router-neighbor)# transport connection-mode passive`	Allows a passive connection setup only. This BGP speaker does not initiate a TCP connection to a BGP peer. You must manually reset the BGP sessions after configuring this command.
remove-private-as **Example**: `switch(config-router-neighbor)# remove-private-as`	Removes private AS numbers from outbound route updates to an eBGP peer. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.
update-source *interface-type number* **Example**: `switch(config-router-neighbor)# update-source ethernet 2/1`	Configures the BGP speaker to use the source IP address of the configured interface for BGP sessions to the peer. This command triggers an automatic notification and session reset for the BGP neighbor sessions.

To tune BGP, use the following optional commands in neighbor address-family configuration mode:

Command	Purpose
suppress-inactive **Example**: `switch(config-router-neighbor-af)# suppress-inactive`	Advertises the best (active) routes only to the BGP peer. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.
default-originate [**route-map** *map-name*] **Example**: `switch(config-router-neighbor-af)# default-originate`	Generates a default route to the BGP peer.
filter-list *list-name* {**in** | **out**} **Example:** `switch(config-router-neighbor-af)# filter-list BGPFilter in`	Applies an AS_path filter list to this BGP peer for inbound or outbound route updates. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.
prefix-list *list-name* {**in** | **out**} **Example:** `switch(config-router-neighbor-af)# prefix-list PrefixFilter in`	Applies a prefix list to this BGP peer for inbound or outbound route updates. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.

Command	Purpose
send-community **Example**: `switch(config-router-neighbor-af)# send-community`	Sends the community attribute to this BGP peer. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.
send-extcommunity **Example**: `switch(config-router-neighbor-af)# send-extcommunity`	Sends the extended community attribute to this BGP peer. This command triggers an automatic soft clear or refresh of BGP neighbor sessions.

Configuring a Graceful Restart

You can configure a graceful restart and enable the graceful restart helper feature for BGP.

BEFORE YOU BEGIN

Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).**SUMMARY STEPS**

1. **configure terminal**
2. **router bgp** *as-number*
3. **graceful-restart**
4. **graceful-restart** [**restart-time** *time* | **stalepath-time** *time*]
5. **graceful-restart-helper**
6. (Optional) **show running-config bgp**
7. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router bgp** *as-number*
	
	Example:
	`switch(config)# router bgp 65536`
	`switch(config-router)#`
		Creates a new BGP process with the configured autonomous system number.

Step 3	**graceful-restart** **Example:** `switch(config-router)# graceful-restart`	Enables a graceful restart and the graceful restart helper functionality. This command is enabled by default. This command triggers an automatic notification and session reset for the BGP neighbor sessions.

	Command	Purpose
Step 4	**graceful-restart** [**restart-time** *time* | **stalepath-time** *time*] **Example:** switch(config-router)# graceful-restart restart-time 300	Configures the graceful restart timers. The optional parameters are as follows: • restart-time—Maximum time for a restart sent to the BGP peer. The range is from 1 to 3600 seconds. The default is 120. • stalepath-time—Maximum time that BGP will keep the stale routes from the restarting BGP peer. The range is from 1 to 3600 seconds. The default is 300. This command triggers an automatic notification and session reset for the BGP neighbor sessions.
Step 5	**graceful-restart-helper** **Example:** switch(config-router)# graceful-restart-helper	Enables the graceful restart helper functionality. Use this command if you have disabled graceful restart but you still want to enable graceful restart helper functionality. This command triggers an automatic notification and session reset for the BGP neighbor sessions.
Step 6	**show running-config bgp** **Example:** switch(config-router)# show running-config bgp	(Optional) Displays the BGP configuration.
Step 7	**copy running-config startup-config** **Example:** switch(config-router)# copy running-config startup-config	(Optional) Saves this configuration change.

This example shows how to enable a graceful restart:

```
switch# configure terminal
switch(config)# router bgp 65536
switch(config-router)# graceful-restart
switch(config-router)# copy running-config startup-config
```

Configuring Virtualization

You can create multiple VRFs and use the same BGP process in each VRF.

BEFORE YOU BEGIN

Ensure that you have enabled the BGP feature (see the "Enabling the BGP Feature" section on page 8-10).

SUMMARY STEPS

1. **configure terminal**
2. **vrf context** *vrf-name*

3. **exit**
4. **router bgp** *as-number*
5. **vrf** *vrf-name*
6. **neighbor** *ip-address* **remote-as** *as-number*
7. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**vrf context** *vrf-name*
	
	Example:
	`switch(config)# vrf context RemoteOfficeVRF`
	`switch(config-vrf)#`
		Creates a new VRF and enters VRF configuration mode.

Step 3	**exit**
	
	Example:
	`switch(config-vrf)# exit`
	`switch(config)#`
		Exits VRF configuration mode.

Step 4	**router bgp** *as-number*
	
	Example:
	`switch(config)# router bgp 65536`
	`switch(config-router)#`
		Creates a new BGP process with the configured autonomous system number.

Step 5	**vrf** *vrf-name*
	
	Example:
	`switch(config-router)# vrf RemoteOfficeVRF`
	`switch(config-router-vrf)#`
		Enters the router VRF configuration mode and associates this BGP instance with a VRF.

Step 6	**neighbor** *ip-address* **remote-as** *as-number*
	
	Example:
	`switch(config-router-vrf)# neighbor 209.165.201.1 remote-as 65536`
	`switch(config-router--vrf-neighbor)#`
		Configures the IP address and AS number for a remote BGP peer.

Step 7	**copy running-config startup-config** **Example:** `switch(config-router-vrf-neighbor)# copy running-config startup-config`	(Optional) Saves this configuration change.

This example shows how to create a VRF and configure the router ID in the VRF:

```
switch# configure terminal
switch(config)# vrf context NewVRF
switch(config-vrf)# exit
switch(config)# router bgp 65536
switch(config-router)# vrf NewVRF
```

```
switch(config-router-vrf)# neighbor 209.165.201.1 remote-as 65536
switch(config-router-vrf-neighbor)# copy running-config startup-config
```

Configuring Policy-Based Administrative Distance

You can configure a distance for external BGP (eBGP) and internal BGP (iBGP) routes that match a policy described in the configured route map. The distance configured in the route map is downloaded to the unicast RIB along with the matching routes. BGP uses the best path to determine the administrative distance when downloading next hops in the unicast RIB table. If there is no match or a deny clause in the policy, BGP uses the distance configured in the distance command or the default distance for routes.

The policy-based administrative distance feature is useful when there are two or more different routes to the same destination from two different routing protocols.

BEFORE YOU BEGIN

- You must enable BGP.
- Ensure that you are in the correct VDC (or use the switchto vdc command).

DETAILED STEPS

Step 1 Enters global configuration mode.

```
switch# configure terminal
```

Step 2 Creates a prefix list to match IP packets or routes with the permit keyword.

```
switch(config)# ip prefix-list name seq number permit prefix-length
```

Step 3 Creates a route map and enters route-map configuration mode with the permit keyword. If the match criteria for the route is met in the policy, the packet is policy routed.

```
switch(config)# route-map map-tag permit sequence-number
```

Step 4 Matches IPv4 network routes based on a prefix list. The prefix-list name can be any alphanumeric string up to 63 characters.

```
switch(config-route-map)# match ip address prefix-list prefix-list-name
```

Step 5 Specifies the administrative distance for interior BGP (iBGP) or exterior BGP (eBGP) routes and BGP routes originated in the local autonomous system. The range is from 1 to 255.

```
switch(config-route-map)# set distance value
```

Step 6 Exits route-map configuration mode.

```
switch(config-route-map)# exit
```

Step 7 Enters BGP mode and assigns the AS number to the local BGP speaker.

```
switch(config)# router bgp as-number
```

Step 8 Enters address family configuration mode.

```
switch(config-router)# address-family {ipv4 | ipv6 | vpnv4 | vpnv6} unicast
```

Step 9 Configures the selective administrative distance for a route map for BGP routes before forwarding them to the RIB table. The table-map name can be any alphanumeric string up to 63 characters.

```
switch(config-router-af)# table-map map-name
```

Note You can also configure the table-map command under the VRF address-family configuration mode.

Step 10 (Optional) Displays forwarding information distribution.

```
switch(config-router-af)# show forwarding distribution
```

Step 11 (Optional) Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

```
switch(config)# copy running-config startup-config
```

Verifying the Advanced BGP Configuration

To display the BGP configuration information, perform one of the following tasks:

Command	Purpose
show bgp all [**summary**] [**vrf** *vrf-name*]	Displays the BGP information for all address families.
show bgp convergence [**vrf** *vrf-name*]	Displays the BGP information for all address families.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **community** {**regexp** *expression* | [**community**] [**no-advertise**] [**no-export**] [**no-export-subconfed**]} [**vrf** *vrf-name*]	Displays the BGP routes that match a BGP community.
show bgp [**vrf** *vrf-name*] **ip** {**unicast** | **multicast**} [*ip-address*] **community-list** *list-name* [**vrf** *vrf-name*]	Displays the BGP routes that match a BGP community list.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **extcommunity** {**regexp** *expression* | **generic** [**non-transitive** | **transitive**] *aa4:nn* [**exact-match**]} [**vrf** *vrf-name*]	Displays the BGP routes that match a BGP extended community.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **extcommunity-list** *list-name* [**exact-match**] [**vrf** *vrf-name*]	Displays the BGP routes that match a BGP extended community list.
show bgp ip {**unicast** | **multicast**} [*ip-address*] {**dampening dampened-paths** [**regexp** *expression*]} [**vrf** *vrf-name*]	Displays the information for BGP route dampening. Use the **clear bgp dampening** command to clear the route flap dampening information.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **history-paths** [**regexp** *expression*] [**vrf** *vrf-name*]	Displays the BGP route history paths.

Command	Purpose
show bgp ip {**unicast** | **multicast**} [*ip-address*] **filter-list** *list-name* [**vrf** *vrf-name*]	Displays the information for the BGP filter list.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **neighbors** [*ip-address*] [**vrf** *vrf-name*]	Displays the information for BGP peers. Use the **clear bgp neighbors** command to clear these neighbors.
show bgp ip {**unicast** | **multicast**} [*ip-address*] {**nexthop** | **nexthop-database**} [**vrf** *vrf-name*]	Displays the information for the BGP route next hop.
show bgp paths	Displays the BGP path information.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **policy** *name* [**vrf** *vrf-name*]	Displays the BGP policy information. Use the **clear bgp policy** command to clear the policy information.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **prefix-list** *list-name* [**vrf** *vrf-name*]	Displays the BGP routes that match the prefix list.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **received-paths** [**vrf** *vrf-name*]	Displays the BGP paths stored for soft reconfiguration.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **regexp** *expression* [**vrf** *vrf-name*]	Displays the BGP routes that match the AS_path regular expression.
show bgp ip {**unicast** | **multicast**} [*ip-address*] **route-map** *map-name* [**vrf** *vrf-name*]	Displays the BGP routes that match the route map.
show bgp peer-policy *name* [**vrf** *vrf-name*]	Displays the information about BGP peer policies.
show bgp peer-session *name* [**vrf** *vrf-name*]	Displays the information about BGP peer sessions.
show bgp peer-template *name* [**vrf** *vrf-name*]	Displays the information about BGP peer templates. Use the **clear bgp peer-template** command to clear all neighbors in a peer template.
show bgp process	Displays the BGP process information.
show ip bgp *options*	Displays the BGP status and configuration information. This command has multiple options. See the *Cisco Nexus 6000 Series Command Reference, Cisco NX-OS Releases 7.x*, for more information.
show ip mbgp *options*	Displays the BGP status and configuration information. This command has multiple options. See the *Cisco Nexus 6000 Series Command Reference, Cisco NX-OS Releases 7.x*, for more information.
show running-configuration bgp	Displays the current running BGP configuration.

Displaying BGP Statistics

To display BGP statistics, use the following commands:

Command	Purpose
show bgp ip {**unicast** | **multicast**} [*ip-address*] **flap-statistics** [**vrf** *vrf-name*]	Displays the BGP route flap statistics. Use the **clear bgp flap-statistics** command to clear these statistics.
show bgp sessions [**vrf** *vrf-name*]	Displays the BGP sessions for all peers. Use the **clear bgp sessions** command to clear these statistics.
show bgp sessions [**vrf** *vrf-name*]	Displays the BGP sessions for all peers. Use the **clear bgp sessions** command to clear these statistics.
show bgp statistics	Displays the BGP statistics.

Related Topics

The following topics can give more information on BGP:

- Chapter 9, "Configuring Advanced BGP"
- Chapter 14, "Configuring Route Policy Manager"

Additional References

For additional information related to implementing BGP, see the following sections:

- Related Documents, page 9-49
- MIBs, page 9-49

Related Documents

Related Topic	Document Title
BGP CLI commands	*Cisco Nexus 6000 Series Command Reference, Cisco NX-OS Releases 7.x*

MIBs

MIBs	MIBs Link
BGP4-MIB CISCO-BGP4-MIB	To locate and download MIBs, go to the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml