



## Configuring Basic BGP

This chapter describes how to configure Border Gateway Protocol (BGP) on the Cisco NX-OS device.

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## About Basic BGP

Cisco NX-OS supports BGP version 4, which 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 devices.

BGP uses a path-vector routing algorithm to exchange routing information between BGP-enabled networking devices or BGP speakers. Based on this information, each BGP speaker determines a path to reach a particular destination while detecting and avoiding paths with routing loops. The routing information includes the actual route prefix for a destination, the path of autonomous systems to the destination, and other path attributes.

BGP selects a single path, by default, as the best path to a destination host or network. Each path carries well-known mandatory, well-known discretionary, and optional transitive attributes that are used in BGP best-path analysis. You can influence BGP path selection by altering some of these attributes by configuring BGP policies. See the [Route Policies and Resetting BGP Sessions](#) section for more information.

BGP also supports load balancing or equal-cost multipath (ECMP). See the [Load Sharing and Multipath](#) section for more information.

## BGP Autonomous Systems

An autonomous system (AS) is a network controlled by a single administration entity. An autonomous system forms a routing domain with one or more interior gateway protocols (IGPs) and a consistent set of routing policies. BGP supports 16-bit and 32-bit autonomous system numbers. For more information, see the [Autonomous Systems](#) section.

Separate BGP autonomous systems dynamically exchange routing information through external BGP (eBGP) peering sessions. BGP speakers within the same autonomous system can exchange routing information through internal BGP (iBGP) peering sessions.

### 4-Byte AS Number Support

BGP supports 2-byte autonomous system (AS) numbers in plain-text notation or as.dot notation and 4-byte AS numbers in plain-text notation.

When BGP is configured with a 4-byte AS number, the **route-target auto VXLAN** command cannot be used because the AS number along with the VNI (which is already a 3-byte value) is used to generate the route target. For more information, see the [Cisco Nexus 9000 Series NX-OS VXLAN Configuration Guide](#).

## Administrative Distance

An administrative distance is a rating of the trustworthiness of a routing information source. By default, BGP uses the administrative distances shown in the table.

**Table 1: BGP Default Administrative Distances**

Distance	Default Value	Function
External	20	Applied to routes learned from eBGP.
Internal	200	Applied to routes learned from iBGP.
Local	220	Applied to routes originated by the router.



**Note** The administrative distance does not influence the BGP path selection algorithm, but it does influence whether BGP-learned routes are installed in the IP routing table.

For more information, see the [Administrative Distance](#) section.

## BGP Peers

A BGP speaker does not discover another BGP speaker automatically. You must configure the relationships between BGP speakers. A BGP peer is a BGP speaker that has an active TCP connection to another BGP speaker.

### BGP Sessions

BGP uses TCP port 179 to create a TCP session with a peer. When a TCP connection is established between peers, each BGP peer initially exchanges all of its routes—the complete BGP routing table—with the other

peer. After this initial exchange, the BGP peers send only incremental updates when a topology change occurs in the network or when a routing policy change occurs. In the periods of inactivity between these updates, peers exchange special messages called keepalives. The hold time is the maximum time limit that can elapse between receiving consecutive BGP update or keepalive messages.

Cisco NX-OS supports the following peer configuration options:

- Individual IPv4 or IPv6 address—BGP establishes a session with the BGP speaker that matches the remote address and AS number.
- IPv4 or IPv6 prefix peers for a single AS number—BGP establishes sessions with BGP speakers that match the prefix and the AS number.
- Dynamic AS number prefix peers—BGP establishes sessions with BGP speakers that match the prefix and an AS number from a list of configured AS numbers.

## Dynamic AS Numbers for Prefix Peers and Interface Peers

Cisco NX-OS accepts a range or list of AS numbers to establish BGP sessions. For example, if you configure BGP to use IPv4 prefix 192.0.2.0/8 and AS numbers 33, 66, and 99, BGP establishes a session with 192.0.2.1 with AS number 66 but rejects a session from 192.0.2.2 with AS number 50.

Beginning with Cisco NX-OS Release 9.3(6), support for dynamic AS numbers is extended to interface peers in addition to prefix peers. See [Configuring BGP Interface Peering via IPv6 Link-Local for IPv4 and IPv6 Address Families](#).

Cisco NX-OS does not associate prefix peers with dynamic AS numbers as either interior BGP (iBGP) or external BGP (eBGP) sessions until after the session is established. See *Configuring Advanced BGP* for more information on iBGP and eBGP.

**Note**

The dynamic AS number prefix peer configuration overrides the individual AS number configuration that is inherited from a BGP template. For more information, see *Configuring Advanced BGP*.

## BGP Router Identifier

To establish BGP sessions between peers, BGP must have a router ID, which is sent to BGP peers in the OPEN message when a BGP session is established. The BGP router ID is a 32-bit value that is often represented by an IPv4 address. You can configure the router ID. By default, Cisco NX-OS sets the router ID to the IPv4 address of a loopback interface on the router. If no loopback interface is configured on the router, the software chooses the highest IPv4 address configured to a physical interface on the router to represent the BGP router ID. The BGP router ID must be unique to the BGP peers in a network.

If BGP does not have a router ID, it cannot establish any peering sessions with BGP peers.

Each routing process has an associated router ID. You can configure the router ID to any interface in the system. If you do not configure the router ID, Cisco NX-OS selects the router ID based on the following criteria:

- Cisco NX-OS prefers loopback0 over any other interface. If loopback0 does not exist, then Cisco NX-OS prefers the first loopback interface over any other interface type.
- If you have not configured a loopback interface, Cisco NX-OS uses the first interface in the configuration file as the router ID. If you configure any loopback interface after Cisco NX-OS selects the router ID,

the loopback interface becomes the router ID. If the loopback interface is not loopback0 and you configure loopback0 with an IP address, the router ID changes to the IP address of loopback0.

- If the interface that the router ID is based on changes, that new IP address becomes the router ID. If any other interface changes its IP address, there is no router ID change.

## BGP Path Selection

BGP supports sending and receiving multiple paths per prefix and advertising such paths. For information on configuring additional BGP paths, see *Configuring Advanced BGP*.

The best-path algorithm runs each time that a path is added or withdrawn for a given network. The best-path algorithm also runs if you change the BGP configuration. BGP selects the best path from the set of valid paths available for a given network.

Cisco NX-OS implements the BGP best-path algorithm in the following steps:

1. Compares two paths to determine which is better (see the Step 1—[BGP Path Selection - Comparing Pairs of Paths](#) section).
2. Explores all paths and determines in which order to compare the paths to select the overall best path (see the “Step 2—[BGP Path Selection - Determining the Order of Comparisons](#)” section).
3. Determines whether the old and new best paths differ enough so that the new best path should be used (see the “Step 3—[BGP Path Selection - Determining the Best-Path Change Suppression](#)” section).



**Note** The order of comparison determined in Part 2 is important. Consider the case where you have three paths, A, B, and C. When Cisco NX-OS compares A and B, it chooses A. When Cisco NX-OS compares B and C, it chooses B. But when Cisco NX-OS compares A and C, it might not choose A because some BGP metrics apply only among paths from the same neighboring autonomous system and not among all paths.

The path selection uses the BGP AS-path attribute. The AS-path attribute includes the list of autonomous system numbers (AS numbers) traversed in the advertised path. If you subdivide your BGP autonomous system into a collection or confederation of autonomous systems, the AS-path contains confederation segments that list these locally defined autonomous systems.



**Note** VXLAN deployments use a BGP path selection process that differs from the normal selection of local over remote paths. For the EVPN address family, BGP compares the sequence number in the MAC Mobility attribute (if present) and selects the path with the higher sequence number. If both paths being compared have the attribute and the sequence numbers are the same, BGP prefers the path that is learned from the remote peer over a locally originated path. For more information, see the [Cisco Nexus 9000 Series NX-OS VXLAN Configuration Guide](#).

### BGP Path Selection - Comparing Pairs of Paths

This first step in the BGP best-path algorithm compares two paths to determine which path is better. The following sequence describes the basic steps that Cisco NX-OS uses to compare two paths to determine the better path:

1. Cisco NX-OS chooses a valid path for comparison. (For example, a path that has an unreachable next hop is not valid.)
2. Cisco NX-OS chooses the path with the highest weight.
3. Cisco NX-OS chooses the path with the highest local preference.
4. If one of the paths is locally originated, Cisco NX-OS chooses that path.
5. Cisco NX-OS chooses the path with the shorter AS path.



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**Note** When calculating the length of the AS-path, Cisco NX-OS ignores confederation segments and counts AS sets as 1. See the *AS Confederations* section for more information.

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6. Cisco NX-OS chooses the path with the lower origin. Interior Gateway Protocol (IGP) is considered lower than EGP.
7. Cisco NX-OS chooses the path with the lower multiexit discriminator (MED).

You can configure Cisco NX-OS to always perform the best-path algorithm MED comparison, regardless of the peer autonomous system in the paths. See the *Tuning the Best-Path Algorithm* section for more information. Otherwise, Cisco NX-OS performs a MED comparison that depends on the AS-path attributes of the two paths being compared:

You can configure Cisco NX-OS to always perform the best-path algorithm MED comparison, regardless of the peer autonomous system in the paths. Otherwise, Cisco NX-OS performs a MED comparison that depends on the AS-path attributes of the two paths being compared:

- a. If a path has no AS-path or the AS-path starts with an AS\_SET, the path is internal and Cisco NX-OS compares the MED to other internal paths.
- b. If the AS-path starts with an AS\_SEQUENCE, the peer autonomous system is the first AS number in the sequence and Cisco NX-OS compares the MED to other paths that have the same peer autonomous system.
- c. If the AS-path contains only confederation segments or starts with confederation segments followed by an AS\_SET, the path is internal and Cisco NX-OS compares the MED to other internal paths.
- d. If the AS-path starts with confederation segments that are followed by an AS\_SEQUENCE, the peer autonomous system is the first AS number in the AS\_SEQUENCE and Cisco NX-OS compares the MED to other paths that have the same peer autonomous system.



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**Note** If Cisco NX-OS receives no MED attribute with the path, Cisco NX-OS considers the MED to be 0 unless you configure the best-path algorithm to set a missing MED to the highest possible value. See the *Tuning the Best-Path Algorithm* section for more information.

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- e. If the non-deterministic MED comparison feature is enabled, the best-path algorithm uses the Cisco IOS style of MED comparison.
8. If one path is from an internal peer and the other path is from an external peer, Cisco NX-OS chooses the path from the external peer.

9. If the paths have different IGP metrics to their next-hop addresses, Cisco NX-OS chooses the path with the lower IGP metric.

10. Cisco NX-OS uses the path that was selected by the best-path algorithm the last time that it was run.

If all path parameters in Step 1 through Step 9 are the same, you can configure the best-path algorithm to enforce comparison of the router IDs when both paths are eBGP by configuring “compare router-id”. In all other cases, the router-id comparison is done by default.

See the *Tuning the Best-Path Algorithm* section for more information. If the path includes an originator attribute, Cisco NX-OS uses that attribute as the router ID to compare to; otherwise, Cisco NX-OS uses the router ID of the peer that sent the path. If the paths have different router IDs, Cisco NX-OS chooses the path with the lower router ID.




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**Note** When using the attribute originator as the router ID, it is possible that two paths have the same router ID. It is also possible to have two BGP sessions with the same peer router, so you could receive two paths with the same router ID.

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11. Cisco NX-OS selects the path with the shorter cluster length. If a path was not received with a cluster list attribute, the cluster length is 0.

12. Cisco NX-OS chooses the path received from the peer with the lower IP address. Locally generated paths (for example, redistributed paths) have a peer IP address of 0.




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**Note** Paths that are equal after Step 9 can be used for multipath if you configure multipath. See the *Load Sharing and Multipath* section for more information.

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## BGP Path Selection - Determining the Order of Comparisons

The second step of the BGP best-path algorithm implementation is to determine the order in which Cisco NX-OS compares the paths:

1. Cisco NX-OS partitions the paths into groups. Within each group, Cisco NX-OS compares the MED among all paths. Cisco NX-OS uses the same rules as in the [BGP Path Selection - Comparing Pairs of Paths](#) section to determine whether MED can be compared between any two paths. Typically, this comparison results in one group being chosen for each neighbor autonomous system. If you configure the **bgp bestpath med always** command, Cisco NX-OS chooses just one group that contains all the paths.
2. Cisco NX-OS determines the best path in each group by iterating through all paths in the group and keeping track of the best one so far. Cisco NX-OS compares each path with the temporary best path found so far and if the new path is better, it becomes the new temporary best path and Cisco NX-OS compares it with the next path in the group.
3. Cisco NX-OS forms a set of paths that contain the best path selected from each group in Step 2. Cisco NX-OS selects the overall best path from this set of paths by going through them as in Step 2.

## BGP Path Selection - Determining the Best-Path Change Suppression

The next part of the implementation is to determine whether Cisco NX-OS uses the new best path or suppresses the new best path. The router can continue to use the existing best path if the new one is identical to the old path (if the router ID is the same). Cisco NX-OS continues to use the existing best path to avoid route changes in the network.

You can turn off the suppression feature by configuring the best-path algorithm to compare the router IDs. See the *Tuning the Best-Path Algorithm* section for more information. If you configure this feature, the new best path is always preferred to the existing one.

## BGP and the Unicast RIB

BGP communicates with the unicast routing information base (unicast RIB) to store IPv4 routes in the unicast routing table. After selecting the best path, if BGP determines that the best path change needs to be reflected in the routing table, it sends a route update to the unicast RIB.

BGP receives route notifications regarding changes to its routes in the unicast RIB. It also receives route notifications about other protocol routes to support redistribution.

BGP also receives notifications from the unicast RIB regarding next-hop changes. BGP uses these notifications to keep track of the reachability and IGP metric to the next-hop addresses.

Whenever the next-hop reachability or IGP metrics in the unicast RIB change, BGP triggers a best-path recalculation for affected routes.

BGP communicates with the IPv6 unicast RIB to perform these operations for IPv6 routes.

## BGP Prefix Independent Convergence

The BGP prefix independent convergence (PIC) edge feature achieves faster convergence in the forwarding plane for BGP IP routes to a BGP backup path when there is a link failure.

The BGP PIC edge feature improves BGP convergence after a network failure. This convergence applies to edge failures in an IP network. This feature creates and stores a backup path in the routing information base (RIB) and forwarding information base (FIB) so that when the primary path fails, the backup path can immediately take over, enabling fast failover in the forwarding plane. BGP PIC edge supports only IPv4 address families.

When BGP PIC edge is configured, BGP calculates a second-best path (the backup path) along with the primary best path. BGP installs both best and backup paths for the prefixes with PIC support into the BGP RIB. BGP also downloads the backup path along with the remote next hop through APIs to the URIB, which then updates the FIB with the next hop marked as a backup. The backup path provides a fast reroute mechanism to counter a singular network failure.

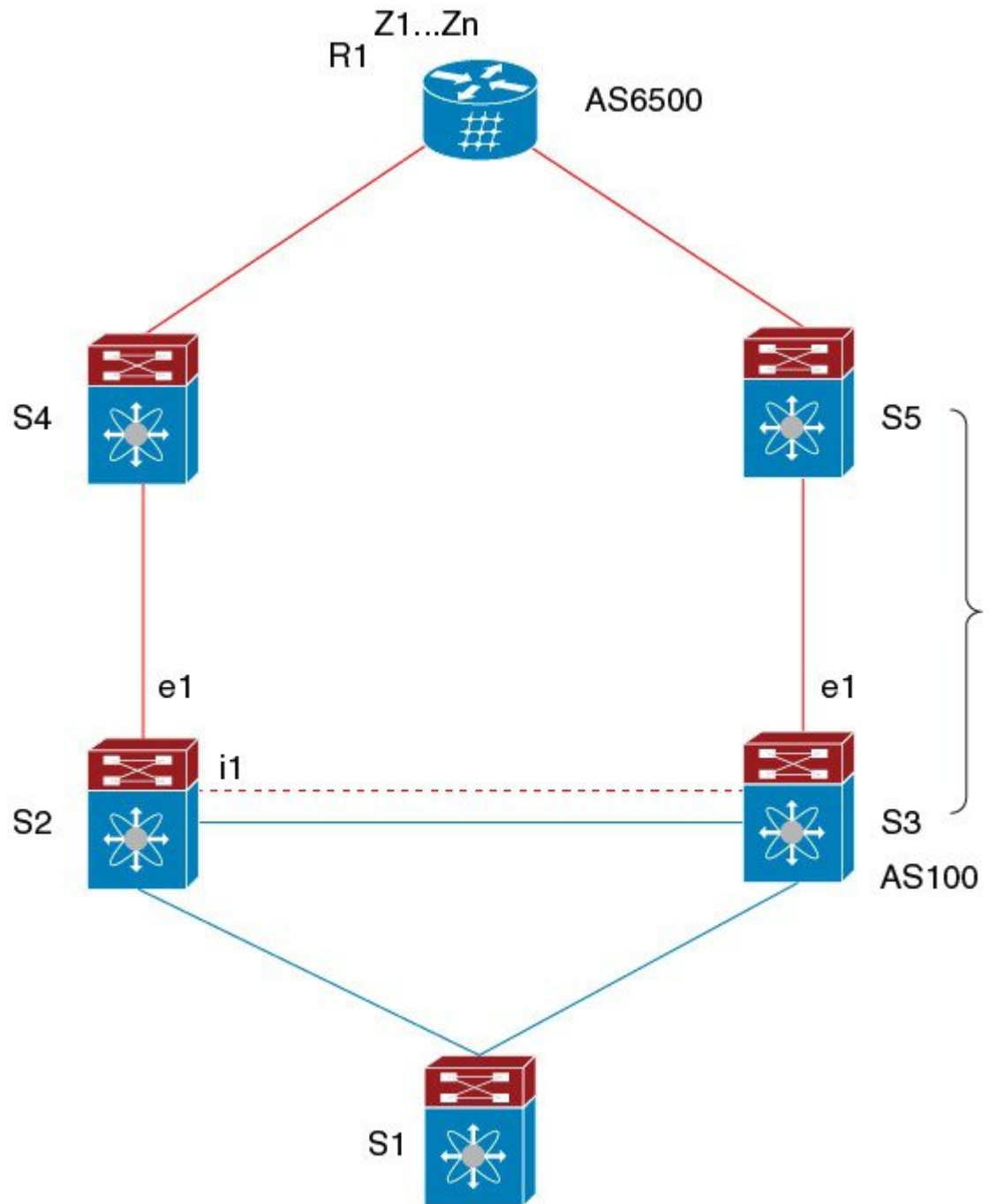
This feature detects both local interface failures and remote interface or link failures and triggers the use of the backup path.

BGP PIC edge supports both unipath and multipath.

## BGP PIC Edge Unipath

The following figure shows a BGP PIC edge unipath topology.

Figure 1: BGP PIC Edge Unipath



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In this figure:

- eBGP sessions are between S2-S4 and S3-S5.
- The iBGP session is between S2-S3.



- Traffic from S1 uses S2 and uses the e1 interface to reach prefixes Z1...Zn.
- S2 has two paths to reach Z1...Zn:
  - A primary path through S4
  - A backup path through S5

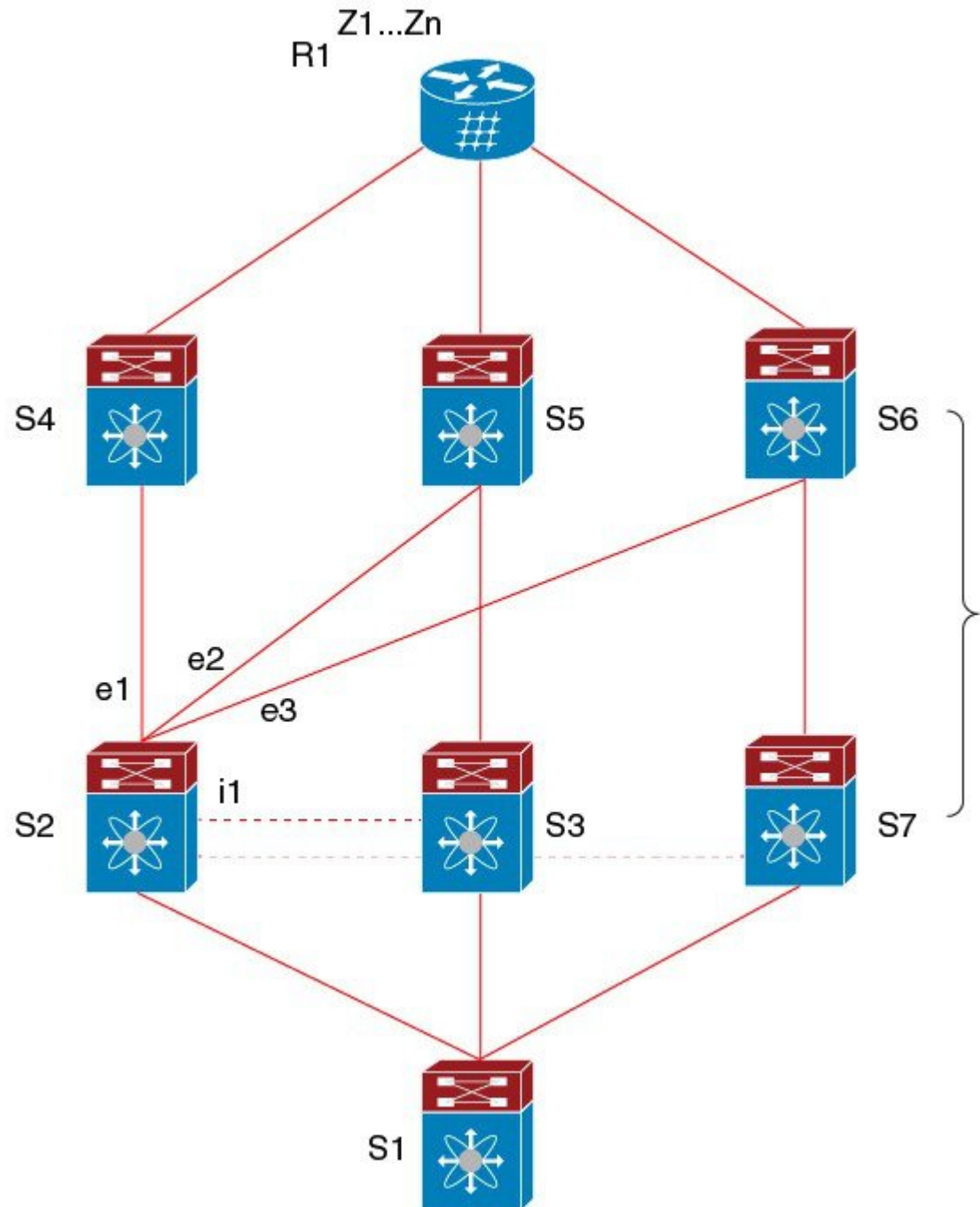
In this example, S3 advertises to S2 the prefixes Z1...Zn to reach (with itself as the next hop). With BGP PIC edge enabled, BGP on S2 installs both the best path (through S4) and the backup path (through S3 or S5) toward the AS6500 into the RIB. Then the RIB downloads both routes to the FIB.

If the S2-S4 link goes down, the FIB on S2 detects the link failure. It automatically switches from the primary path to the backup path and points to the new next hop S3. Traffic is quickly rerouted due to the local fast re-convergence in the FIB. After learning of the link failure event, BGP on S2 recomputes the best path (which is the previous backup path), removes next hop S4 from the RIB, and reinstalls S3 as the primary next hop into the RIB. BGP also computes a new backup path, if any, and notifies the RIB. With the support of the BGP PIC edge feature, the FIB can switch to the available backup route instantly upon detection of a link failure on the primary route without waiting for BGP to select the new best path and converge to achieve a fast reroute.

## BGP PIC Edge with Multipath

The following figure shows a BGP PIC edge multipath topology.

Figure 2: BGP PIC Edge Multipaths



In this topology, there are six paths for a given prefix:

- eBGP paths: e1, e2, e3
- iBGP paths: i1, i2, i3

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The order of preference is  $e1 > e2 > e3 > i1 > i2 > i3$ .

The potential multipath situations are:

- No multipaths configured:
  - bestpath = e1
  - multipath-set = []
  - backup path = e2
  - PIC behavior: When e1 fails, e2 is activated.
- Two-way eBGP multipaths configured:
  - bestpath = e1
  - multipath-set = [e1, e2]
  - backup path = e3
  - PIC behavior: Active multipaths are mutually backed up. When all multipaths fail, e3 is activated.
- Three-way eBGP multipaths configured:
  - bestpath = e1
  - multipath-set = [e1, e2, e3]
  - backup path = i1
  - PIC behavior: Active multipaths are mutually backed up. When all multipaths fail, i1 is activated.
- Four-way eBGP multipaths configured:
  - – bestpath = e1
  - – multipath-set = [e1, e2, e3, i1]
  - – backup path = i2
  - – PIC behavior: Active multipaths are mutually backed up. When all multipaths fail, i2 is activated.

When the Equal Cost Multipath Protocol (ECMP) is enabled, none of the multipaths can be selected as the backup path.

For multipaths with the backup path scenario, faster convergence is not expected with simultaneous failure of all active multipaths.

## BGP PIC Core

BGP Prefix Independent Convergence (PIC) in Core improves BGP convergence after a network failure. For example, if a link fails on Provider Edge (PE), the Routing Information Base (RIB) updates the Forwarding Information Base (FIB) with new next hop. FIB must update all BGP prefixes that point to the failed next hop and point to the new one. This can be time and resource consuming. With BGP PIC Core enabled, the prefix is programmed in the FIB in a hierarchical way. All prefixes point to the ECMP group instead of the recursive next hop. When the same failure happens, the FIB only needs to update the ECMP group to point to the new next hop without updating prefixes. This gives BGP immediate leveraging of IGP convergence.

## BGP PIC Feature Support Matrix

Table 2: BGP PIC Feature Support Matrix

BGP PIC	IPv4 Unicast	IPv6 Unicast
Edge unipath	Yes	No
Edge with multipath (multiple active ECMPs, only one backup)	Yes	No
Core	Yes	Yes

## BGP Virtualization

BGP supports virtual routing and forwarding (VRF) instances.

## Prerequisites for BGP

BGP has the following prerequisites:

- You must enable BGP (see the [Enabling BGP](#) section).
- 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 configure at least one IGP that is capable of recursive next-hop resolution.
- You must configure an address family under a neighbor for the BGP session establishment.

## Guidelines and Limitations for Basic BGP

BGP has the following configuration guidelines and limitations:

- With sufficient scale (such as - hundreds of peers and thousands of routes per peer) the Graceful Restart mechanism may fail because the default 5 minute stale-path timer might not be enough for BGP convergence to complete before the timer expires. Use the following command to verify the actual time taken for the convergence process:

```
switch# show bgp vrf all all neighbors | in First|RIB
Last End-of-RIB received 0.022810 after session start
Last End-of-RIB sent 00:08:36 after session start
First convergence 00:08:36 after session start with 398002 routes sent
```

- Beginning with Cisco NX-OS 9.3(5), a packet with a TTL value of 1 to a vPC peer is hardware forwarded.
- For large routing tables (250 K or above) when using the SNMP bulkwalk with record option (-Cr), do not use more than 10 records to avoid SNMP performance degradation.

- Names in the prefix-list are case-insensitive. We recommend using unique names. Do not use the same name by modifying uppercase and lowercase characters. For example, CTCPrimaryNetworks and CtcPrimaryNetworks are not two different entries.
- For information about supported platforms, see [Supported Platforms](#).
- The dynamic AS number prefix peer configuration overrides the individual AS number configuration that is 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 that are 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 that are received and system resources used.
- Configure the update source to establish a session with BGP/eBGP multihop sessions.
- Specify a BGP policy if you configure redistribution.
- Define the BGP router ID within a VRF.
- For IPv6 neighbors, Cisco recommends that you configure a router ID per VRF. If a VRF does not have any IPv4 interfaces, the IPv6 BGP neighbor will not come up because its router ID must be an IPv4 address. The numerically lowest loopback IPv4 address is elected to be the router ID. If a loopback address does not exist, the lowest IP address from the VRF interfaces is elected. If that does not exist, the BGP neighbor relationship is not established.
- If you decrease the keepalive and hold timer values, you might experience BGP session flaps.
- You can configure a minimum route advertisement interval (MRAI) between the sending of BGP routing updates by using the **advertisement-interval** command.
- Although the **show ip bgp** commands are available for verifying the BGP configuration, Cisco recommends that you use the **show bgp** commands instead.
- Route-map deletion feature adds a mechanism to block the deletion of entire route-map that is associated with the BGP. With the route-map deletion blocked, the modifications to the route-map statement are still allowed.
- If there are more than one sequence in the route-map, user can still delete any route map sequence until there is at least one sequence available.
- Users can have the forward reference case for route-map from client. However, once route-map is created and associated, the deletion of route-map is blocked.
- Blocking deletion functionality is configurable dynamically using the knob.
- It is allowed to delete the BGP association to the route-map and deletion of route-map itself in a single transaction payload.
- It is allowed to add the BGP association to the route-map and an error must be thrown for deletion of route-map.
- The following is the list of the dual stage related behaviors:

- If knob and deletion occur together, dual stage has to verify and throw an error without commit.
- If knob already exists and route-map deletion occurs in dual stage, it must throw an error.
- If route-map and CLI knob is single commit with different order, it must throw an error.
- If knob is not enabled and route-map deletion occurs in dual stage, it has to execute successfully.
- In a single verify, if "cli knob is disabled AND route-map deletion" is executed, the route-map deletion is allowed.
- If the route-map used by BGP template is not inherited by any of the BGP neighbors, the entire route-map deletion will still be blocked.
- Cloudscale IPv6 link-local BGP support requires carving > 512 ing-sup TCAM region (this requires a reload to take effect).

## Default Settings

**Table 3: Default BGP Parameters**

Parameters	Default
BGP feature	Disabled
Keep alive interval	60 seconds
Hold timer	180 seconds
BGP PIC edge	Disabled
Auto-summary	Always disabled
Synchronization	Always disabled

## CLI Configuration Modes

The following sections describe how to enter each of the CLI configuration modes for BGP. From a mode, you can enter the ? command to display the commands available in that mode.

### Global Configuration Mode

Use global configuration mode to create a BGP process and configure advanced features such as AS confederation and route dampening. For more information, see *Configuring Advance BGP*.

This example shows how to enter router configuration mode:

```
switch# configuration
switch(config)# router bgp 64496
switch(config-router)#
```

BGP supports VRF. You can configure BGP within the appropriate VRF if you are using VRFs in your network. See the [Configuring Virtualization](#) section for more information.

This example shows how to enter VRF configuration mode:

```
switch(config)# router bgp 64497
switch(config-router)# vrf vrf_A
switch(config-router-vrf)#
```

## Address Family Configuration Mode

You can optionally configure the address families that BGP supports. Use the address-family command in router configuration mode to configure features for an address family. Use the address-family command in neighbor configuration mode to configure the specific address family for the neighbor.

You must configure the address families if you are using route redistribution, address aggregation, load balancing, and other advanced features.

The following example shows how to enter address family configuration mode from the router configuration mode:

```
switch(config)# router bgp 64496
switch(config-router)# address-family ipv6 unicast
switch(config-router-af)#
```

The following example shows how to enter VRF address family configuration mode if you are using VRFs:

```
switch(config)# router bgp 64497
switch(config-router)# vrf vrf_A
switch(config-router-vrf)# address-family ipv6 unicast
switch(config-router-vrf-af)#
```

## Neighbor Configuration Mode

Cisco NX-OS provides the neighbor configuration mode to configure BGP peers. You can use neighbor configuration mode to configure all parameters for a peer.

The following example shows how to enter neighbor configuration mode:

```
switch(config)# router bgp 64496
switch(config-router)# neighbor 192.0.2.1
switch(config-router-neighbor)#
```

The following example shows how to enter VRF neighbor configuration mode:

```
switch(config)# router bgp 64497
switch(config-router)# vrf vrf_A
switch(config-router-vrf)# neighbor 192.0.2.1
switch(config-router-vrf-neighbor)#
```

## Neighbor Address Family Configuration Mode

An address family configuration submode inside the neighbor configuration submode is available for entering address family-specific neighbor configuration and enabling the address family for the neighbor. Use this mode for advanced features such as limiting the number of prefixes allowed for this neighbor and removing private AS numbers for eBGP.

With the introduction of RFC 5549, you can configure an IPv4 address family for a neighbor with an IPv6 address.

This example shows how to enter the IPv4 neighbor address family configuration mode for a neighbor with an IPv4 address:

```
switch(config)# router bgp 64496
switch(config-router)# neighbor 192.0.2.1
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)#
```

This example shows how to enter the IPv4 neighbor address family configuration mode for a neighbor with an IPv6 address:

```
switch(config)# router bgp 64496
switch(config-router)# neighbor 2001:db8::/64 eui64
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor-af)#
```

This example shows how to enter the VRF IPv4 neighbor address family configuration mode for a neighbor with an IPv4 address:

```
switch(config)# router bgp 64497
switch(config-router)# vrf vrf_A
switch(config-router-vrf)# neighbor 209.165.201.1
switch(config-router-vrf-neighbor)# address-family ipv4 unicast
switch(config-router-vrf-neighbor-af)#
```

This example shows how to enter the VRF IPv4 neighbor address family configuration mode for a neighbor with an IPv6 address:

```
switch(config)# router bgp 64497
switch(config-router)# vrf vrf_A
switch(config-router-vrf)# neighbor 2001:db8::/64 eui64
switch(config-router-vrf-neighbor)# address-family ipv4 unicast
switch(config-router-vrf-neighbor-af)#
```

## Configuring Basic BGP

To configure a basic BGP, you must enable BGP and configure a BGP peer. Configuring a basic BGP network consists of a few required tasks and many optional tasks. You must configure a BGP routing process and BGP peers.

**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.

## Enabling BGP

You must enable BGP before you can configure BGP.

### SUMMARY STEPS

1. **configure terminal**
2. **[no] feature bgp**



3. (Optional) **show feature**
4. (Optional) **copy running-config startup-config**

## DETAILED STEPS

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters configuration mode.
<b>Step 2</b>	<b>[no] feature bgp</b> <b>Example:</b> <pre>switch(config)# feature bgp</pre>	Enables BGP. Use the <b>no</b> form of this command to disable this feature.
<b>Step 3</b>	(Optional) <b>show feature</b> <b>Example:</b> <pre>switch(config)# show feature</pre>	Displays enabled and disabled features.
<b>Step 4</b>	(Optional) <b>copy running-config startup-config</b> <b>Example:</b> <pre>switch(config)# copy running-config startup-config</pre>	Saves this configuration change.

## Creating a BGP Instance

You can create a BGP instance and assign a router ID to the BGP instance. For more information, see the *BGP Router Identifier* section.

### Before you begin

- You must enable BGP (see the [Enabling BGP](#) section).
- BGP must be able to obtain a router ID (for example, a configured loopback address).

## SUMMARY STEPS

1. **configure terminal**
2. **[no] router bgp** {*autonomous-system-number* | *auto*}
3. **router-id** {*ip-address* | *auto*}
4. (Optional) **address-family** {**ipv4**|**ipv6**} {**unicast**|**multicast**}
5. (Optional) **network** {*ip-address/length* | *ip-address mask mask*} [**route-map** *map-name*]
6. (Optional) **show bgp all**
7. (Optional) **copy running-config startup-config**

## DETAILED STEPS

## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters configuration mode.
<b>Step 2</b>	<b>[no] router bgp {autonomous-system-number   auto}</b>  <b>Example:</b> <pre>switch(config)# router bgp 64496 switch(config-router)#</pre>	<p>Enables BGP and assigns the AS number to the local BGP speaker. 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.</p> <p>Auto automatically generates 4-Byte Private Autonomous System Number based on system MAC address.</p> <p>Use the no option with this command to remove the BGP process and the associated configuration.</p>
<b>Step 3</b>	<b>router-id {ip-address   auto}</b>  <b>Example:</b> <pre>switch(config-router)# router-id 192.0.2.255</pre>	<p>(Optional) Configures the BGP router ID. This IP address identifies this BGP speaker.</p> <p>"auto" option will enable the BGP router ID based on system MAC address.</p>
<b>Step 4</b>	<b>(Optional) address-family {ipv4 ipv6} {unicast multicast}</b>  <b>Example:</b> <pre>switch(config-router)# address-family ipv4 unicast switch(config-router-af)#</pre>	Enters global address family configuration mode for the IPv4 or IPv6 address family.
<b>Step 5</b>	<b>(Optional) network {ip-address/length   ip-address mask mask} [route-map map-name]</b>  <b>Example:</b> <pre>switch(config-router-af)# network 10.10.10.0/24</pre> <b>Example:</b> <pre>switch(config-router-af)# network 10.10.10.0 mask 255.255.255.0</pre>	<p>Specifies a network as local to this autonomous system and adds it to the BGP routing table.</p> <p>For exterior protocols, the network command controls which networks are advertised. Interior protocols use the <b>network</b> command to determine where to send updates.</p>
<b>Step 6</b>	<b>(Optional) show bgp all</b>  <b>Example:</b> <pre>switch(config-router-af)# show bgp all</pre>	Displays information about all BGP address families.
<b>Step 7</b>	<b>(Optional) copy running-config startup-config</b>  <b>Example:</b> <pre>switch(config-router-af)# copy running-config startup-config</pre>	Saves this configuration change.

### Example

This example shows how to enable BGP with the IPv4 unicast address family and manually add one network to advertise:

```
switch# configure terminal
switch(config)# router bgp 64496
switch(config-router)# address-family ipv4 unicast
switch(config-router-af)# network 192.0.2.0
switch(config-router-af)# copy running-config startup-config
```

## Restarting a BGP Instance

You can restart a BGP instance and clear all peer sessions for the instance.

To restart a BGP instance and remove all associated peers, use the following command:

### SUMMARY STEPS

1. `restart bgpinstance-tag`

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
Step 1	<code>restart bgpinstance-tag</code> <b>Example:</b> <code>switch(config)# restart bgp 201</code>	Restarts the BGP instance and resets or reestablishes all peering sessions.

## Shutting Down BGP

You can shut down the BGP protocol and gracefully disable BGP while retaining the configuration.

To shut down BGP, use the following command in router configuration mode:

### SUMMARY STEPS

1. `shutdown`

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
Step 1	<code>shutdown</code> <b>Example:</b>	Restarts the BGP instance and resets or reestablishes all peering sessions.

	Command or Action	Purpose
	<code>switch(config-router)# shutdown</code>	

## Configuring BGP Peers

You can configure a BGP peer within a BGP process. Each BGP peer has an associated keepalive timer and hold timers. You can set these timers either globally or for each BGP peer. A peer configuration overrides a global configuration.



**Note** You must configure the address family under neighbor configuration mode for each peer.

### Before you begin

- You must enable BGP (see the [Enabling BGP](#) section).

### SUMMARY STEPS

- configure terminal**
- router bgp** *autonomous-system-number*
- neighbor** {*ip-address* | *ipv6-address*} **remote-as** {*as-number* | *external* | *internal*}
- remote-as** {*as-number* | *external* | *internal*}
- (Optional) **description** *text*
- (Optional) **timers***keepalive-time hold-time*
- (Optional) **shutdown**
- address-family** {*ipv4*|*ipv6*} {*unicast*|*multicast*}
- (Optional) **weight** *value*
- (Optional) **show bgp** {*ipv4*|*ipv6*} {*unicast*|*multicast*} **neighbors**
- (Optional) **copy running-config startup-config**

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> <code>switch# configure terminal</code> <code>switch(config)#</code>	Enters configuration mode.
<b>Step 2</b>	<b>router bgp</b> <i>autonomous-system-number</i>  <b>Example:</b> <code>switch(config)# router bgp 64496</code> <code>switch(config-router)#</code>	Enables BGP and assigns the AS number to the local BGP speaker. 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.

	Command or Action	Purpose
<b>Step 3</b>	<b>neighbor</b> { <i>ip-address</i>   <i>ipv6-address</i> } <b>remote-as</b> { <i>as-number</i>   <i>external</i>   <i>internal</i> }  <b>Example:</b> <pre>switch(config-router)# neighbor 209.165.201.1 remote-as 64497 switch(config-router)# neighbor</pre>	<p>Configures the IPv4 or IPv6 address and AS number for a remote BGP peer. The <i>ip-address</i> format is x.x.x.x. The <i>ipv6-address</i> format is A:B::C:D.</p> <p>The external and internal options allow eBGP and iBGP sessions to be established without manually providing remote-as values.</p>
<b>Step 4</b>	<b>remote-as</b> { <i>as-number</i>   <i>external</i>   <i>internal</i> }  <b>Example:</b> <pre>switch(config-router-neighbor)# remote-as 64497</pre>	<p>Configures the AS number for a remote external BGP peer.</p> <p>The external and internal options allow eBGP and iBGP sessions to be established without manually providing remote-as values.</p>
<b>Step 5</b>	(Optional) <b>description</b> <i>text</i>  <b>Example:</b> <pre>switch(config-router-neighbor)# description Peer Router B switch(config-router-neighbor)#</pre>	<p>Adds a description for the neighbor. The description is an alphanumeric string up to 80 characters.</p>
<b>Step 6</b>	(Optional) <b>timers</b> <i>keepalive-time hold-time</i>  <b>Example:</b> <pre>switch(config-router-neighbor)# timers 30 90</pre>	<p>Adds the keepalive and hold time BGP timer values for the neighbor. The range is from 0 to 3600 seconds. The default value of keepalive time is 60 seconds and hold time is 180 seconds.</p> <p><b>Note</b> BGP sessions with a hold-timer of 10 seconds or less are not effective until the BGP session has been up for 60 seconds or more. Once the session has been up for 60 seconds, the hold-timer will work as configured.</p>
<b>Step 7</b>	(Optional) <b>shutdown</b>  <b>Example:</b> <pre>switch(config-router-neighbor)# shutdown</pre>	<p>Administratively shuts down this BGP neighbor. This command triggers an automatic notification and session reset for the BGP neighbor sessions.</p>
<b>Step 8</b>	<b>address-family</b> { <i>ipv4</i>   <i>ipv6</i> } { <i>unicast</i>   <i>multicast</i> }  <b>Example:</b> <pre>switch(config-router-neighbor)# address-family ipv4 unicast switch(config-router-neighbor-af)#</pre>	<p>Enters neighbor address family configuration mode for the unicast IPv4 or IPv6 address family.</p>
<b>Step 9</b>	(Optional) <b>weight</b> <i>value</i>  <b>Example:</b> <pre>switch(config-router-neighbor-af)# weight 100</pre>	<p>Sets the default weight for routes from this neighbor. The range is from 0 to 65535.</p> <p>All routes learned from this neighbor have the assigned weight initially. The route with the highest weight is chosen as the preferred route when multiple routes are available to a particular network. The weights assigned with the <b>set weight route-map</b> command override the weights assigned with this command.</p>

	Command or Action	Purpose
		If you specify a BGP peer policy template, all the members of the template inherit the characteristics configured with this command.
<b>Step 10</b>	(Optional) <b>show bgp {ipv4 ipv6} {unicast multicast} neighbors</b>  <b>Example:</b> <pre>switch(config-router-neighbor-af) # show bgp ipv4 unicast neighbors</pre>	Displays information about BGP peers.
<b>Step 11</b>	(Optional) <b>copy running-config startup-config</b>  <b>Example:</b> <pre>switch(config-router-neighbor-af) # copy running-config startup-config</pre>	Saves this configuration change.

### Example

The following example shows how to configure a BGP peer:

```
switch# configure terminal
switch(config)# router bgp 64496
switch(config-router)# neighbor 192.0.2.1 remote-as 64497
switch(config-router-neighbor)# description Peer Router B
switch(config-router-neighbor)# address-family ipv4 unicast
switch(config-router-neighbor)# weight 100
switch(config-router-neighbor-af)# copy running-config startup-config
```

## Configuring Dynamic AS Numbers for Prefix Peers

You can configure multiple BGP peers within a BGP process. You can limit BGP session establishment to a single AS number or multiple AS numbers in a route map.

BGP sessions configured through dynamic AS numbers for prefix peers ignore the **ebgp-multihop** command and the **disable-connected-check** command.

You can change the list of AS numbers in the route map, but you must use the **no neighbor** command to change the route-map name. Changes to the AS numbers in the configured route map affect only new sessions.

### Before you begin

- You must enable BGP (see the [Enabling BGP](#) section).

### SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *autonomous-system-number*
3. **neighbor** *prefix* **remote-as** *route-map* *map-name*
4. **neighbor-as** *as-number*
5. (Optional) **show bgp {ipv4 | ipv6} {unicast | multicast} neighbors**

## 6. (Optional) copy running-config startup-config

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters configuration mode.
<b>Step 2</b>	<b>router bgp <i>autonomous-system-number</i></b>  <b>Example:</b> <pre>switch(config)# router bgp 64496 switch(config-router)#</pre>	Enables BGP and assigns the AS number to the local BGP speaker. 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.
<b>Step 3</b>	<b>neighbor <i>prefix</i> remote-as route-map <i>map-name</i></b>  <b>Example:</b> <pre>switch(config-router)# neighbor 192.0.2.0/8 remote-as routemap BGPPeers switch(config-router-neighbor)#</pre>	<p>Configures the IPv4 or IPv6 prefix and a route map for the list of accepted AS numbers for the remote BGP peers. The <i>prefix</i> format for IPv4 is x.x.x.x/length. The length range is from 1 to 32. The <i>prefix</i> format for IPv6 is A:B::C:D/length. The length range is from 1 to 128.</p> <p>The <i>map-name</i> can be any case-sensitive, alphanumeric string up to 63 characters.</p>
<b>Step 4</b>	<b>neighbor-as <i>as-number</i></b>  <b>Example:</b> <pre>switch(config-router-neighbor)# remote-as 64497</pre>	Configures the AS number for a remote BGP peer.
<b>Step 5</b>	<b>(Optional) show bgp {ipv4   ipv6} {unicast   multicast} neighbors</b>  <b>Example:</b> <pre>switch(config-router-neighbor-af)# show bgp ipv4 unicast neighbors</pre>	Displays information about BGP peers.
<b>Step 6</b>	<b>(Optional) copy running-config startup-config</b>  <b>Example:</b> <pre>switch(config-router-neighbor-af)# copy running-config startup-config</pre>	Saves this configuration change.

#### Example

This example shows how to configure dynamic AS numbers for a prefix peer:

```
switch# configure terminal
switch(config)# route-map BGPPeers
switch(config-route-map)# match as-number 64496, 64501-64510
switch(config-route-map)# match as-number as-path-list List1, List2
```

```

switch(config-route-map) # exit
switch(config) # router bgp 64496
switch(config-router) # neighbor 192.0.2.0/8 remote-as route-map BGPPeers
switch(config-router-neighbor) # description Peer Router B
switch(config-router-neighbor) # address-family ipv4 unicast
switch(config-router-af) # end
switch# copy running-config startup-config

```

See [Configuring Route Policy Manager](#) for information on route maps.

## Configuring BGP PIC Edge

Follow these steps to configure BGP PIC edge.



**Note** The BGP PIC edge feature supports only IPv4 address families.

### Before you begin

You must enable BGP (see the [Enabling BGP](#) section).

### SUMMARY STEPS

1. **configure terminal**
2. **router bgp** *autonomous-system-number*
3. **address-family ipv4 unicast**
4. **[no] additional-paths install backup**
5. (Optional) **copy running-config startup-config**

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> <pre>switch# configure terminal switch(config) #</pre>	Enters configuration mode.
<b>Step 2</b>	<b>router bgp</b> <i>autonomous-system-number</i>  <b>Example:</b> <pre>switch(config) # router bgp 64496 switch(config-router) #</pre>	Enables BGP and assigns the AS number to the local BGP speaker. 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.
<b>Step 3</b>	<b>address-family ipv4 unicast</b>  <b>Example:</b>	Enters address family configuration mode for the IPv4 address family.



	Command or Action	Purpose
	switch(config-router)# address-family ipv4 unicast switch(config-router-af)#	
<b>Step 4</b>	<b>[no] additional-paths install backup</b>  <b>Example:</b>  switch(config-router-af)# [no] additional-paths install backup	Enables BGP to install the backup path to the routing table.
<b>Step 5</b>	(Optional) <b>copy running-config startup-config</b>  <b>Example:</b>  switch(config-router-af)# end switch# copy running-config startup-config	Saves this configuration change.

### Example

This example shows how to configure the device to support BGP PIC edge in an IPv4 network:

```
interface Ethernet2/2
 ip address 1.1.1.5/24
 no shutdown

interface Ethernet2/3
 ip address 2.2.2.5/24
 no shutdown

router bgp 100
 address-family ipv4 unicast
  additional-paths install backup
 neighbor 2.2.2.6
  remote-as 100
 address-family ipv4 unicast
```

If BGP receives the same prefix (for example, 99.0.0.0/24) from the two neighbors 1.1.1.6 and 2.2.2.6, both paths are installed in the URIB, one as the primary path and the other as the backup path.

BGP output:

```
switch(config)# show ip bgp 99.0.0.0/24
BGP routing table information for VRF default, address family IPv4 Unicast BGP routing table
entry
for 99.0.0.0/24, version 4
Paths: (2 available, best #2)
Flags: (0x00001a) on xmit-list, is in urib, is best urib route

Path type: internal, path is valid, not best reason: Internal path, backup path AS-Path:
200 , path
sourced external to AS
2.2.2.6 (metric 0) from 2.2.2.6 (2.2.2.6)
Origin IGP, MED not set, localpref 100, weight 0

Advertised path-id 1
Path type: external, path is valid, is best path AS-Path: 200 , path sourced external to
AS
```

```
1.1.1.6 (metric 0) from 1.1.1.6 (99.0.0.1)
Origin IGP, MED not set, localpref 100, weight 0
```

```
Path-id 1 advertised to peers: 2.2.2.6
```

URIB output:

```
switch(config)# show ip route 99.0.0.0/24
IP Route Table for VRF "default" '*' denotes best ucast next-hop '*' denotes best mcast
next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>
99.0.0.0/24, ubest/mbest: 1/0
*via 1.1.1.6, [20/0], 14:34:51, bgp-100, external, tag 200
via 2.2.2.6, [200/0], 14:34:51, bgp-100, internal, tag 200 (backup)
```

UFIB output:

```
switch# show forwarding route 123.1.1.0 detail module 8
Prefix 123.1.1.0/24, No of paths: 1, Update time: Wed Jul 11 19:00:12 2018
Vobj id: 141 orig_as: 65002 peer_as: 65100 rnh: 10.3.0.2
10.4.0.2 Ethernet8/4 DMAC: 0018.bad8.4dfd
packets: 2 bytes: 3484 Repair path 10.3.0.2 Ethernet8/3 DMAC: 0018.bad8.4dfd packets:
0
bytes: 1
```

## Configuring BGP PIC Core

Follow these steps to configure BGP PIC Core.

### SUMMARY STEPS

1. configure terminal
2. [no] system pic-core
3. copy running-config startup-config
4. reload

### DETAILED STEPS

#### Procedure

	Command or Action	Purpose
Step 1	configure terminal  Example: switch# configure terminal	Enter global configuration mode.
Step 2	[no] system pic-core  Example: switch(config)# system pic-core	Manage PIC enable.

	Command or Action	Purpose
<b>Step 3</b>	<b>copy running-config startup-config</b> <b>Example:</b> switch(config) # <b>copy running-config startup-config</b>	Saves this configuration change.
<b>Step 4</b>	<b>reload</b> <b>Example:</b> switch(config) # <b>reload</b>	Reboots the entire device.

## Clearing BGP Information

To clear BGP information, use the following commands:

Command	Purpose
<b>clear bgp all</b> { <i>neighbor</i>   *   <i>as-number</i>   <i>peer-template name</i>   <i>prefix</i> } [ <b>vrf</b> <i>vrf-name</i> ]	<p>Clears one or more neighbors from all address families. * clears all neighbors in all address families. The arguments are as follows:</p> <ul style="list-style-type: none"> <li>• <i>neighbor</i>—IPv4 or IPv6 address of a neighbor.</li> <li>• <i>as-number</i>—Autonomous system number. The AS number can be a 16-bit integer or a 32-bit integer in the form of higher 16-bit decimal number and a lower 16-bit decimal number in xx.xx format.</li> <li>• <i>name</i>—Peer template name. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> <li>• <i>prefix</i>—IPv4 or IPv6 prefix. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>
<b>clear bgp all dampening</b> [ <b>vrf</b> <i>vrf-name</i> ]	Clears route flap dampening networks in all address families. The <i>vrf-name</i> can be any case-sensitive, alphanumeric string up to 64 characters.
<b>clear bgp all flap-statistics</b> [ <b>vrf</b> <i>vrf-name</i> ]	Clears route flap statistics in all address families. The <i>vrf-name</i> can be any case-sensitive, alphanumeric string up to 64 characters.
<b>clear bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } <b>dampening</b> [ <b>vrf</b> <i>vrf-name</i> ]	Clears route flap dampening networks in the selected address family. The <i>vrf-name</i> can be any case-sensitive, alphanumeric string up to 64 characters.

Command	Purpose
<b>clear bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } <b>flap-statistics</b> [ <b>vrf</b> <i>vrf-name</i> ]	Clears route flap statistics in the selected address family. The <i>vrf-name</i> can be any case-sensitive, alphanumeric string up to 64 characters.
<b>clear bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <i>neighbor</i>   *   <i>as-number</i>   <b>peer-template</b> <i>name</i>   <i>prefix</i> } [ <b>vrf</b> <i>vrf-name</i> ]	<p>Clears one or more neighbors from the selected address family. * clears all neighbors in the address family. The arguments are as follows:</p> <ul style="list-style-type: none"> <li>• <i>neighbor</i>—IPv4 or IPv6 address of a neighbor.</li> <li>• <i>as-number</i>— Autonomous system number. The AS number can be a 16-bit integer or a 32-bit integer in the form of higher 16-bit decimal number and a lower 16-bit decimal number in xx.xx format.</li> <li>• <i>name</i>—Peer template name. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> <li>• <i>prefix</i>—IPv4 or IPv6 prefix. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>
<b>clear bgp</b> { <b>ip</b> { <b>unicast</b>   <b>multicast</b> }} { <i>neighbor</i>   *   <i>as-number</i>   <b>peer-template</b> <i>name</i>   <i>prefix</i> } [ <b>vrf</b> <i>vrf-name</i> ]	<p>Clears one or more neighbors. * clears all neighbors in the address family. The arguments are as follows:</p> <ul style="list-style-type: none"> <li>• <i>neighbor</i>—IPv4 or IPv6 address of a neighbor.</li> <li>• <i>as-number</i>— Autonomous system number. The AS number can be a 16-bit integer or a 32-bit integer in the form of higher 16-bit decimal number and a lower 16-bit decimal number in xx.xx format.</li> <li>• <i>name</i>—Peer template name. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> <li>• <i>prefix</i>—IPv4 or IPv6 prefix. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>

Command	Purpose
<b>clear bgp dampening</b> [ <i>ip-neighbor</i>   <i>ip-prefix</i> ] [ <b>vrf</b> <i>vrf-name</i> ]	Clears route flap dampening in one or more networks. The arguments are as follows: <ul style="list-style-type: none"> <li>• <i>ip-neighbor</i>—IPv4 address of a neighbor.</li> <li>• <i>ip-prefix</i>—IPv4. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>
<b>clear bgp flap-statistics</b> [ <i>ip-neighbor</i>   <i>ip-prefix</i> ] [ <b>vrf</b> <i>vrf-name</i> ]	Clears route flap statistics in one or more networks. The arguments are as follows: <ul style="list-style-type: none"> <li>• <i>ip-neighbor</i>—IPv4 address of a neighbor.</li> <li>• <i>ip-prefix</i>—IPv4. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>
<b>clear ip mbgp</b> { <b>ip</b> { <b>unicast</b>   <b>multicast</b> }} { <i>neighbor</i>   *   <i>as-number</i>   <b>peer-template</b> <i>name</i>   <i>prefix</i> } [ <b>vrf</b> <i>vrf-name</i> ]	Clears one or more neighbors. * clears all neighbors in the address family. The arguments are as follows: <ul style="list-style-type: none"> <li>• <i>neighbor</i>—IPv4 or IPv6 address of a neighbor.</li> <li>• <i>as-number</i>— Autonomous system number. The AS number can be a 16-bit integer or a 32-bit integer in the form of higher 16-bit decimal number and a lower 16-bit decimal number in xx.xx format.</li> <li>• <i>name</i>—Peer template name. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> <li>• <i>prefix</i>—IPv4 or IPv6 prefix. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>

Command	Purpose
<b>clear ip mbgp dampening</b> [ <i>ip-neighbor</i>   <i>ip-prefix</i> ] [ <i>vrf vrf-name</i> ]	Clears route flap dampening in one or more networks. The arguments are as follows: <ul style="list-style-type: none"> <li>• <i>ip-neighbor</i>—IPv4 address of a neighbor.</li> <li>• <i>ip-prefix</i>—IPv4. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>
<b>clear ip mbgp flap-statistics</b> [ <i>ip-neighbor</i>   <i>ip-prefix</i> ] [ <i>vrf vrf-name</i> ]	Clears route flap statistics in one or more networks. The arguments are as follows: <ul style="list-style-type: none"> <li>• <i>ip-neighbor</i>—IPv4 address of a neighbor.</li> <li>• <i>ip-prefix</i>—IPv4. All neighbors within that prefix are cleared.</li> <li>• <i>vrf-name</i>—VRF name. All neighbors in that VRF are cleared. The name can be any case-sensitive, alphanumeric string up to 64 characters.</li> </ul>

## Verifying the Basic BGP Configuration

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

Command	Purpose
<b>show bgp all</b> [summary] [ <i>vrf vrf-name</i> ]	Displays the BGP information for all address families.
<b>show bgp convergence</b> [ <i>vrf vrf-name</i> ]	Displays the BGP information for all address families.
<b>show bgp</b> { <i>ipv4</i>   <i>ipv6</i> } {unicast   multicast} [ <i>ip-address</i>   <i>ipv6-prefix</i> community [regex expression] [community] [no-advertise] [no-export] [no-export-subconfed]] [ <i>vrf vrf-name</i> ]	Displays the BGP routes that match a BGP community.
<b>show bgp</b> [ <i>vrf vrf-name</i> ] { <i>ipv4</i>   <i>ipv6</i> } {unicast   multicast} [ <i>ip-address</i>   <i>ipv6-prefix</i> ] community-list list-name [ <i>vrf vrf-name</i> ]	Displays the BGP routes that match a BGP community list.
<b>show bgp</b> { <i>ipv4</i>   <i>ipv6</i> } {unicast   multicast} [ <i>ip-address</i>   <i>ipv6-prefix</i> extcommunity [regex expression] [generic [non-transitive   transitive] aa4:nn [exact-match]] [ <i>vrf vrf-name</i> ]	Displays the BGP routes that match a BGP extended community.
<b>show bgp</b> { <i>ipv4</i>   <i>ipv6</i> } {unicast   multicast} [ <i>ip-address</i>   <i>ipv6-prefix</i> extcommunity-list list-name [exact-match]] [ <i>vrf vrf-name</i> ]	Displays the BGP routes that match a BGP extended community list.

Command	Purpose
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] { <b>dampening</b> <b>dampened-paths</b> [ <b>regex</b> <i>expression</i> ]} [ <b>vrf</b> <i>vrf-name</i> ]	Displays the information for BGP route dampening. Use the <b>clear bgp dampening</b> command to clear the route flap dampening information.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>history-paths</b> [ <b>regex</b> <i>expression</i> ] [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP route history paths.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>filter-list</b> <i>list-name</i> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the information for the BGP filter list.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] [ <b>vrf</b> <i>vrf-name</i> ]	Displays the information for BGP peers. Use the <b>clear bgp neighbors</b> command to clear these neighbors.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } <b>unicast neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] { [ <b>advertised-routes</b>   <b>received-routes</b> ] } [ <b>detail</b> ] [ <b>vrf</b> <i>vrf-name</i> ]  <b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } <b>unicast neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] [ <b>routes</b> ] { [ <b>advertised</b>   <b>received</b> ] } [ <b>detail</b> ] [ <b>vrf</b> <i>vrf-name</i> ]	Displays the detailed information of all routes: <ul style="list-style-type: none"> <li>received from the peer before evaluating inbound route map.</li> <li>advertised to the peer before updating attributes by outbound route map.</li> </ul>
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } <b>unicast neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] [ <b>routes</b> ] [ <b>detail</b> ] [ <b>vrf</b> <i>vrf-name</i> ]	Displays the detailed information of all routes received from this peer after evaluating inbound route map.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } <b>unicast neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] [ <b>advertised-routes</b> <b>processed</b> ] [ <b>vrf</b> <i>vrf-name</i> ]	Displays brief information of all routes advertised to the peer after updating path attributes by outbound route map with <b>processed</b> option.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } <b>unicast neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] [ <b>advertised-routes</b> <b>processed</b> ] [ <b>detail</b> ] [ <b>vrf</b> <i>vrf-name</i> ]	Displays detailed information of all routes advertised to the peer after updating path attributes by outbound route map with <b>processed</b> option.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>neighbors</b> [ <i>ip-address</i>   <i>ipv6-prefix</i> ] { <b>nexthop</b>   <b>nexthop-database</b> } [ <b>vrf</b> <i>vrf-name</i> ]	Displays the information for the BGP route next hop.
<b>show bgp paths</b>	Displays the BGP path information.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>policy name</b> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP policy information. Use the <b>clear bgp policy</b> command to clear the policy information.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>prefix-list</b> <i>list-name</i> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP routes that match the prefix list.

Command	Purpose
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>received-paths</b> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP paths stored for soft reconfiguration.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>regex</b> <i>expression</i> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP routes that match the AS_path regular expression.
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>route-map</b> <i>map-name</i> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP routes that match the route map.
<b>show bgp peer-policy</b> <i>name</i> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the information about BGP peer policies.
<b>show bgp peer-session</b> <i>name</i> [ <b>vrf</b> <i>vrf-name</i> ] <b>show bgp peer-session</b>	Displays the information about BGP peer sessions.
<b>show bgp peer-template</b> <i>name</i> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the information about BGP peer templates. Use the <b>clear bgp peer-template</b> command to clear all neighbors in a peer template.
<b>show bgp process</b>	Displays the BGP process information.
<b>show</b> { <b>ipv</b>   <b>ipv6</b> } <b>bgp</b> [ <i>options</i> ]	Displays the BGP status and configuration information.
<b>show</b> { <b>ipv</b>   <b>ipv6</b> } <b>mbgp</b> [ <i>options</i> ]	Displays the BGP status and configuration information.
<b>show running-configuration bgp</b>	Displays the current running BGP configuration.

## Monitoring BGP Statistics

To display BGP statistics, use the following commands:

Command	Purpose
<b>show bgp</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>unicast</b>   <b>multicast</b> } [ <i>ip-address</i>   <i>ipv6-prefix</i> ] <b>flap-statistics</b> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP route flap statistics. Use the <b>clear bgp flap-statistics</b> command to clear these statistics.
<b>show bgp sessions</b> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the BGP sessions for all peers. Use the <b>clear bgp sessions</b> command to clear these statistics.
<b>show bgp statistics</b>	Displays the BGP statistics.



# Configuration Examples for Basic BGP

This example shows a basic BGP configuration:

```
switch(config)# feature bgp
switch(config)# router bgp 64496
switch(config-router)# neighbor 2001:ODB8:0:1::55 remote-as 64496
switch(config-router)# address-family ipv6 unicast
switch(config-router-af)# next-hop-self
```

## Related Topics

The following topics relate to BGP:

- *Configuring Advance BGP*
- *Configuring Route Policy Manager*

## Where to Go Next

See *Configuring Advance BGP*, for details on the following features:

- Peer templates
- Route redistribution
- Route maps

## Additional References

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

### MIBs for Basic BGP

MIBs	MIBs Link
MIBs related to BGP	To locate and download MIBs, go to the following URL: <a href="ftp://ftp.cisco.com/pub/mibs/supportlists/nexus9000/Nexus9000MIBSupportList.html">ftp://ftp.cisco.com/pub/mibs/supportlists/nexus9000/Nexus9000MIBSupportList.html</a>

