



BGP Graceful Shutdown

The BGP Graceful Shutdown feature reduces or eliminates the loss of traffic along a link being shut down for maintenance. Routers always have a valid route available during the convergence process. This feature is used primarily for maintenance on a link between a Provider Edge (PE), PE-PE, PE- Route Reflector (RR), PE-Customer Edge (CE) and CE.

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Information About BGP Graceful Shutdown

Purpose and Benefits of BGP Graceful Shutdown

There are times when planned maintenance operations cause routing changes in BGP. After the shutdown of eBGP and iBGP peering sessions between autonomous system border routers (ASBRs), BGP devices are temporarily unreachable during BGP convergence. The goal of gracefully shutting down one or more BGP sessions is to minimize traffic loss during the planned shutdown and subsequent reestablishment of the sessions.

The BGP Graceful Shutdown feature reduces or eliminates the loss of inbound or outbound traffic flows that were initially forwarded along the peering link that is being shut down for maintenance. This feature is primarily for PE-CE, PE-RR and PE-PE links. Lowering the local preference for paths received over the session being shutdown renders the affected paths less preferred by the BGP decision process, but still allows the paths to be used during the convergence while alternative paths are propagated to the affected devices. Therefore, devices always have a valid route available during the convergence process.

The feature also allows vendors to provide a graceful shutdown mechanism that does not require any router reconfiguration at maintenance time. The benefits of the BGP Graceful Shutdown feature are fewer lost packets and less time spent reconfiguring devices.

GSHUT Community

The GSHUT community is a well-known community used in conjunction with the BGP Graceful Shutdown feature. The GSHUT community attribute is applied to a neighbor specified by the **neighbor shutdown**

graceful command, thereby gracefully shutting down the link in an expected number of seconds. The GSHUT community is always sent by the GSHUT initiator.

The GSHUT community is specified in a community list, which is referenced by a route map and then used to make policy routing decisions.

The GSHUT community can also be used in the **show ip bgp community** command to limit output to GSHUT routes.

BGP GSHUT Enhancement

The BGP Graceful Shutdown (GSHUT) Enhancement feature enables graceful shutdown of either all neighbors or only virtual routing and forwarding (VRF) neighbors across BGP sessions. To enable the BGP GSHUT enhancement feature on the device, you must configure either the **community** keyword or the **local-preference** keyword in the **bgp graceful-shutdown all** command. Use the **activate** keyword to activate graceful shutdown either across all neighbors or only across all VRF neighbors, across all BGP sessions.

How to Configure BGP Graceful Shutdown

Shutting Down a BGP Link Gracefully

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **neighbor** {*ipv4-address* | *ipv6-address*} **remote-as** *number*
5. **neighbor** {*ipv4-address* | *ipv6-address* | *peer-group-name*} **shutdown graceful** *seconds* {**community** *value* [**local-preference** *value*] | **local-preference** *value*}
6. **end**
7. **show ip bgp community gshut**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	router bgp <i>autonomous-system-number</i> Example: <pre>Device(config)# router bgp 5000</pre>	Configures a BGP routing process.
Step 4	neighbor { <i>ipv4-address</i> <i>ipv6-address</i> } remote-as <i>number</i> Example: <pre>Device(config-router)# neighbor 2001:db8:3::1 remote-as 5500</pre>	Configures the autonomous system (AS) to which the neighbor belongs.
Step 5	neighbor { <i>ipv4-address</i> <i>ipv6-address</i> <i>peer-group-name</i> } shutdown graceful <i>seconds</i> { community <i>value</i> [local-preference <i>value</i>] local-preference <i>value</i> } Example: <pre>Device(config-router)# neighbor 2001:db8:3::1 shutdown graceful 600 community 1200 local-preference 300</pre>	Configures the device to gracefully shut down the link to the specified peer in the specified number of seconds; advertises the route with the GSHUT (Graceful Shutdown) community; and advertises the route with another community or specifies a local preference value for the route, or both. • Make sure to specify an adequate amount of time for iBGP peers to converge and to choose an alternate path as the best path. • If the graceful keyword is used in the neighbor shutdown command, at least one of the two attributes (a community or local preference) must be configured. You may configure both attributes. • If the graceful keyword is used in the neighbor shutdown command, the route is advertised with the GSHUT community by default. You may also set one other community for policy routing purposes. • In this particular example, the route to the neighbor is configured to shut down in 600 seconds, is advertised with the GSHUT community and community 1200, and is configured with a local preference of 300. • The device receiving the advertisement looks at the community value(s) of the route and optionally uses the community value to apply routing policy. Filtering routes based on a community is done with the ip community-list command and a route map. • During the graceful shutdown, the neighbor shutdown command is not nvgened. After the timer expires, SHUTDOWN is nvgened.
Step 6	end Example: <pre>Device(config-router)# end</pre>	Returns to EXEC mode.

	Command or Action	Purpose
Step 7	show ip bgp community gshut Example: Device# show ip bgp community gshut	(Optional) Displays information about the routes that are advertised with the well-known GSHUT community.

Filtering BGP Routes Based on the GSHUT Community

Perform this task on a BGP peer to the device where you enabled the BGP Graceful Shutdown feature.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **neighbor** {*ipv4-address* | *ipv6-address*} **remote-as** *number*
5. **neighbor** {*ipv4-address* | *ipv6-address*} **activate**
6. **neighbor** {*ipv4-address* | *ipv6-address*} **send-community**
7. **exit**
8. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
9. **match community** {*standard-list-number* | *expanded-list-number* | *community-list-name* [**exact**]}
10. **exit**
11. **ip community-list** {*standard* | **standard** *list-name*} {**deny** | **permit**} **gshut**
12. **router bgp** *autonomous-system-number*
13. **neighbor** *address* **route-map** *map-name* **in**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	router bgp <i>autonomous-system-number</i> Example: Device(config)# router bgp 2000	Configures a BGP routing process.

	Command or Action	Purpose
Step 4	neighbor { <i>ipv4-address</i> <i>ipv6-address</i> } remote-as <i>number</i> Example: <pre>Device(config-router)# neighbor 2001:db8:4::1 remote-as 1000</pre>	Configures the autonomous system (AS) to which the neighbor belongs.
Step 5	neighbor { <i>ipv4-address</i> <i>ipv6-address</i> } activate Example: <pre>Device(config-router)# neighbor 2001:db8:4::1 activate</pre>	Activates the neighbor.
Step 6	neighbor { <i>ipv4-address</i> <i>ipv6-address</i> } send-community Example: <pre>Device(config-router)# neighbor 2001:db8:4::1 send-community</pre>	Enables BGP community exchange with the neighbor.
Step 7	exit Example: <pre>Device(config-router)# exit</pre>	Exits router configuration mode.
Step 8	route-map <i>map-tag</i> [permit deny] [<i>sequence-number</i>] Example: <pre>Device(config)# route-map RM_GSHUT deny 10</pre>	Configures a route map to permit or deny routes for policy routing.
Step 9	match community { <i>standard-list-number</i> <i>expanded-list-number</i> <i>community-list-name</i> [exact]} Example: <pre>Device(config-route-map)# match community GSHUT</pre>	Configures that the routes that match ip community-list GSHUT will be policy routed.
Step 10	exit Example: <pre>Device(config-route-map)# exit</pre>	Exits route-map configuration mode.
Step 11	ip community-list { <i>standard</i> standard <i>list-name</i> } { deny permit } gshut Example: <pre>Device(config)# ip community-list standard GSHUT permit gshut</pre>	Configures a community list and permits or denies routes that have the GSHUT community to the community list. If you specify other communities in the same statement, there is a logical AND operation and all communities in the statement must match the communities for the route in order for the statement to be processed.

	Command or Action	Purpose
Step 12	router bgp <i>autonomous-system-number</i> Example: <pre>Device(config)# router bgp 2000</pre>	Configures a BGP routing process.
Step 13	neighbor address route-map map-name in Example: <pre>Device(config)# neighbor 2001:db8:4::1 route-map RM_GSHUT in</pre>	Applies the route map to incoming routes from the specified neighbor. In this example, the route map named RM_GSHUT denies routes from the specified neighbor that have the GSHUT community.

Configuring BGP GSHUT Enhancement

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **bgp graceful-shutdown all** {**neighbors** | **vrfs**} *shutdown-time* {**community** *community-value* [**local-preference** *local-pref-value*] | **local-preference** *local-pref-value* [**community** *community-value*]}
5. **bgp graceful-shutdown all** {**neighbors** | **vrfs**} **activate**
6. **end**
7. **show ip bgp**
8. **show running-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	enable Example: <pre>Device> enable</pre>	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 3	router bgp <i>autonomous-system-number</i> Example:	Enters router configuration mode to create or configure a BGP routing process.

	Command or Action	Purpose
	Device(config)# router bgp 65000	
Step 4	bgp graceful-shutdown all {neighbors vrfs} <i>shutdown-time {community community-value</i> <i>[local-preference local-pref-value] local-preference</i> <i>local-pref-value [community community-value]}</i> Example: Device(config-router)# bgp graceful-shutdown all neighbors 180 local-preference 20 community 10	Enables the BGP GSHUT enhancement feature on the device.
Step 5	bgp graceful-shutdown all {neighbors vrfs} activate Example: Device(config-router)# bgp graceful-shutdown all neighbors activate	Activates graceful shutdown across all neighbors or only across VRF neighbors for BGP sessions.
Step 6	end Example: Device(config-router)# end	Returns to privileged EXEC mode.
Step 7	show ip bgp Example: Device# show ip bgp neighbors 10.2.2.2 include shutdown	Displays entries in the BGP routing table.
Step 8	show running-config Example: Device# show running-config session router bgp	Displays running configuration on the device.

Configuration Examples for BGP Graceful Shutdown

Example: Shutting Down a BGP Link Gracefully

Graceful Shutdown While Setting a Local-Preference

This example gracefully shuts down the link to the specified neighbor in 600 seconds, adds the GSHUT community to the route, and sets a local preference of 500 for the route.

```
router bgp 1000
 neighbor 2001:db8:5::1 remote-as 2000
 neighbor 2001:db8:5::1 shutdown graceful 600 local-preference 500
```

Example: Filtering BGP Routes Based on the GSHUT Community

```
neighbor 2001:db8:5::1 send-community
exit
```

Graceful Shutdown While Setting an Additional Community

This example gracefully shuts down the link to the specified neighbor in 600 seconds, and adds the GSHUT community and numbered community to the route.

```
router bgp 1000
neighbor 2001:db8:5::1 remote-as 2000
neighbor 2001:db8:5::1 shutdown graceful 600 community 1400
neighbor 2001:db8:5::1 send-community
exit
```

Graceful Shutdown while Setting an Additional Community and Local-Preference

This example gracefully shuts down the link to the specified neighbor in 600 seconds, adds the GSHUT community and the numbered community to the route, and sets a local preference of 500 to the route.

```
router bgp 1000
neighbor 2001:db8:5::1 remote-as 2000
neighbor 2001:db8:5::1 shutdown graceful 600 community 1400 local-preference 500
neighbor 2001:db8:5::1 send-community
exit
```

Example: Filtering BGP Routes Based on the GSHUT Community

In addition to being able to gracefully shut down a BGP route, another use of the GSHUT community is to configure a community list to filter routes with this community from getting into the BGP routing table.

This example illustrates how to use a community list to filter incoming BGP routes based on the GSHUT community. In this example, a route map named RM_GSHUT denies routes based on a standard community list named GSHUT. The community list contains routes with the GSHUT community. The route map is then applied to incoming routes from the neighbor at 2001:db8:4::1.

```
router bgp 2000
neighbor 2001:db8:4::1 remote-as 1000
neighbor 2001:db8:4::1 activate
neighbor 2001:db8:4::1 send-community
exit
route-map RM_GSHUT deny 10
match community GSHUT
exit
ip community-list standard GSHUT permit gshut
router bgp 2000
neighbor 2001:db8:4::1 route-map RM_GSHUT in
```

Example: BGP GSHUT Enhancement

The following example shows how to enable and activate the BGP GSHUT enhancement feature across all neighbors. In this example, the neighbors are configured to gracefully shutdown within the specified duration of 180 seconds.

```
Device> enable
Device# configure terminal
Device(config)# router bgp 65000
Device(config-router)# bgp graceful-shutdown all neighbors 180 local-preference 20 community 10
Device(config-router)# bgp graceful-shutdown all neighbors activate
Device(config-router)# end
```

Following is sample output from the **show ip bgp** command, which displays the graceful shutdown time for each neighbor. In this example, there are two IPv4 neighbors configured with IP address 10.2.2.2 and 172.16.2.1 and one VRF neighbor, tagged v1, is configured with IP address 192.168.1.1.

```
Device# show ip bgp neighbors 10.2.2.2 | include shutdown

Graceful Shutdown Timer running, schedule to reset the peer in 00:02:47 seconds
Graceful Shutdown Localpref set to 20
Graceful Shutdown Community set to 10

Device# show ip bgp neighbors 172.16.2.1 | include shutdown

Graceful Shutdown Timer running, schedule to reset the peer in 00:02:38 seconds
Graceful Shutdown Localpref set to 20
Graceful Shutdown Community set to 10

Device# show ip bgp vpnv4 vrf v1 neighbors 192.168.1.1 | include shutdown

Graceful Shutdown Timer running, schedule to reset the peer in 00:01:45 seconds
Graceful Shutdown Localpref set to 20
Graceful Shutdown Community set to 10
```

Following is sample output from the **show running-config** command, which displays information associated with the BGP session in router configuration mode:

```
Device# show running-config | session router bgp

router bgp 65000
bgp log-neighbor-changes
bgp graceful-shutdown all neighbors 180 local-preference 20 community 10
network 10.1.1.0 mask 255.255.255.0
neighbor 10.2.2.2 remote-as 40
neighbor 10.2.2.2 shutdown
neighbor 172.16.2.1 remote-as 10
neighbor 172.16.2.1 shutdown
!
address-family vpnv4
neighbor 172.16.2.1 activate
neighbor 172.16.2.1 send-community both
exit-address-family
!
address-family ipv4 vrf v1
neighbor 192.168.1.1 remote-as 30
neighbor 192.168.1.1 shutdown
```

```
neighbor 192.168.1.1 activate
neighbor 192.168.1.1 send-community both
exit-address-family
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
BGP commands	Cisco IOS IP Routing: BGP Command Reference

Standards and RFCs

Standard/RFC	Title
RFC 6198	<i>Requirements for the Graceful Shutdown of BGP Sessions</i>

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for BGP Graceful Shutdown

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for BGP Graceful Shutdown

Feature Name	Releases	Feature Information
BGP Graceful Shutdown		The BGP Graceful Shutdown feature reduces or eliminates the loss of traffic along a link being shut down for maintenance. Routers always have a valid route available during the convergence process. The following commands were modified: ip community-list, neighbor shutdown, show ip bgp community, and show ip bgp vpnv4.
BGP GSHUT Enhancement		The BGP Graceful Shutdown (GSHUT) Enhancement feature enables graceful shutdown of either all neighbors or only virtual routing and forwarding (VRF) neighbors across BGP sessions. The following command was introduced: bgp graceful-shutdown all.

