QoS Policy Propagation via BGP

The QoS Policy Propagation via BGP feature allows you to classify packets by IP precedence based on the Border Gateway Protocol (BGP) community lists, BGP autonomous system paths, and access lists. After packets have been classified, you can use other quality of service (QoS) features such as committed access rate (CAR) and Weighted Random Early Detection (WRED) to specify and enforce policies to fit your business model.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

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.

Prerequisites for QoS Policy Propagation via BGP

- Enable the Border Gateway Protocol (BGP) and Cisco Express Forwarding (CEF) or distributed CEF (dCEF) on the device. Subinterfaces on an ATM interface that have the **bgp-policy** command enabled must use CEF mode because dCEF is not supported. dCEF uses the Versatile Interface Processor (VIP) rather than the Route Switch Processor (RSP) to perform forwarding functions.
- Define the policy.
- Apply the policy through BGP.

- Configure the BGP community list, BGP autonomous system path, or access list and enable the policy on an interface.
- Enable committed access rate (CAR) or Weighted Random Early Detection (WRED) to use the policy.

Information About QoS Policy Propagation via BGP

Benefits of QoS Policy Propagation via BGP

The QoS Policy Propagation via BGP feature allows you to classify packets by IP precedence based on Border Gateway Protocol (BGP) community lists, BGP autonomous system paths, and access lists. After a packet has been classified, you can use other quality of service (QoS) features such as committed access rate (CAR) and Weighted Random Early Detection (WRED) to specify and enforce policies to fit your business model.

How to Configure QoS Policy Propagation via BGP

Configuring QoS Policy Propagation via BGP Based on Community Lists

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [
4. **match community** {*standard-list-number* | *expanded-list-number* | *community-list-name* [**exact**]}
5. **set ip precedence** [*number* | *name*]
6. **exit**
7. **router bgp** *autonomous-system*
8. **table-map** *route-map-name*
9. **exit**
10. **ip community-list** *standard-list-number* {**permit** | **deny**} [*community-number*]
11. **interface** *type number*
12. **bgp-policy** {**source** | **destination**} **ip-prec-map**
13. **exit**
14. **ip bgp-community new-format**
15. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [**Example:** `Device(config)# route-map alpha permit ordering-seq`	Configures a route map and specifies how the packets are to be distributed. .
Step 4	**match community** {*standard-list-number* | *expanded-list-number* | *community-list-name* [**exact**]} **Example:** `Device(config-route-map)# match community 1`	Matches a Border Gateway Protocol (BGP) community list.
Step 5	**set ip precedence** [*number* | *name*] **Example:** `Device(config-route-map)# set ip precedence 5`	Sets the IP Precedence field when the community list matches. **Note** You can specify either a precedence number or a precedence name.
Step 6	**exit** **Example:** `Device(config-route-map)# exit`	Exits route-map configuration mode and returns to global configuration mode.
Step 7	**router bgp** *autonomous-system* **Example:** `Device(config)# router bgp 45000`	Enables a BGP process and enters router configuration mode.
Step 8	**table-map** *route-map-name* **Example:** `Device(config-router)# table-map rm1`	Modifies the metric and tag values when the IP routing table is updated with BGP learned routes.
Step 9	**exit** **Example:** `Device(config-router)# exit`	Exits router configuration mode and returns to global configuration mode.
Step 10	**ip community-list** *standard-list-number* {**permit** | **deny**} [*community-number*] **Example:**	Creates a community list for BGP and controls access to it.

	Command or Action	Purpose
	`Device(config)# ip community-list 1 permit 2`	
Step 11	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 0/0/0`	Specifies the interface (or subinterface) and enters interface configuration mode.
Step 12	**bgp-policy** {**source** | **destination**} **ip-prec-map** **Example:** `Device(config-if)# bgp-policy source ip-prec-map`	Classifies packets using IP precedence.
Step 13	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode and returns to global configuration mode.
Step 14	**ip bgp-community new-format** **Example:** `Device(config)# ip bgp-community new-format`	(Optional) Displays the BGP community number in AA:NN (autonomous system:community number/4-byte number) format.
Step 15	**end** **Example:** `Device(config)# end`	Exits global configuration mode and returns to privileged EXEC mode.

Configuring QoS Policy Propagation via BGP Based on the Autonomous System Path Attribute

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **named-ordering-route-map enable**]
4. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [**ordering-seq** *sequence-name*
5. **match as-path** *path-list-number*
6. **set ip precedence** [*number* | *name*]
7. **exit**
8. **router bgp** *autonomous-system*
9. **table-map** *route-map-name*
10. **exit**
11. **ip as-path access-list** *access-list-number* {**permit** | **deny**} *as-regular-expression*
12. **interface** *type number*

13. **bgp-policy** {**source** | **destination**} **ip-prec-map**
14. **end**

DETAILED STEPS

	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	**named-ordering-route-map enable**] **Example:** `Device(config)# named-ordering-route-map enable`	Enables ordering of route-maps based on a string provided by the user.
Step 4	**route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [**ordering-seq** *sequence-name* **Example:** `Device(config)# route-map alpha permit ordering-seq sequence1`	Configures a route map and specifies how the packets are to be distributed. **ordering-seq** indicates the sequence that is to be used for ordering of route-maps.
Step 5	**match as-path** *path-list-number* **Example:** `Device(config-route-map)# match as-path 2`	Matches a Border Gateway Protocol (BGP) autonomous system path access list.
Step 6	**set ip precedence** [*number* | *name*] **Example:** `Device(config-route-map)# set ip precedence 5`	Sets the IP Precedence field when the autonomous-system path matches. **Note** You can specify either a precedence number or a precedence name.
Step 7	**exit** **Example:** `Device(config-route-map)# exit`	Exits route-map configuration mode and returns to global configuration mode.
Step 8	**router bgp** *autonomous-system* **Example:** `Device(config)# router bgp 45000`	Enables a BGP process and enters router configuration mode.
Step 9	**table-map** *route-map-name* **Example:**	Modifies the metric and tag values when the IP routing table is updated with BGP learned routes.

	Command or Action	Purpose
	`Device(config-router)# table-map rm1`	
Step 10	**exit** **Example:** `Device(config-router)# exit`	Exits router configuration mode and returns to global configuration mode.
Step 11	**ip as-path access-list** *access-list-number* {**permit** | **deny**} *as-regular-expression* **Example:** `Device(config)# ip as-path access-list 500 permit 45000`	Defines an autonomous system path access list.
Step 12	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 0/0/0`	Specifies the interface (or subinterface) and enters interface configuration mode.
Step 13	**bgp-policy** {**source** | **destination**} **ip-prec-map** **Example:** `Device(config-if)# bgp-policy source ip-prec-map`	Classifies packets using IP precedence.
Step 14	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Configuring QoS Policy Propagation via BGP Based on an Access List

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **named-ordering-route-map enable**]
4. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [**ordering-seq** *sequence-name*
5. **match ip address** *access-list-number*
6. **set ip precedence** [*number* | *name*]
7. **exit**
8. **router bgp** *autonomous-system*
9. **table-map** *route-map-name*
10. **exit**
11. **access-list** *access-list-number* {**permit** | **deny**} *source*
12. **interface** *type number*
13. **bgp-policy** {**source** | **destination**} **ip-prec-map**
14. **end**

DETAILED STEPS

	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	**named-ordering-route-map enable**] **Example:** `Device(config)# named-ordering-route-map enable`	Enables ordering of route-maps based on a string provided by the user.
Step 4	**route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [**ordering-seq** *sequence-name* **Example:** `Device(config)# route-map alpha permit ordering-seq sequence1`	Configures a route map and specifies how the packets are to be distributed. **ordering-seq** indicates the sequence that is to be used for ordering of route-maps.
Step 5	**match ip address** *access-list-number* **Example:** `Device(config-route-map)# match ip address 69`	Matches an access list.
Step 6	**set ip precedence** [*number* | *name*] **Example:** `Device(config-route-map)# set ip precedence routine`	Sets the IP precedence field when the autonomous system path matches.
Step 7	**exit** **Example:** `Device(config-route-map)# exit`	Exits route-map configuration mode and returns to global configuration mode.
Step 8	**router bgp** *autonomous-system* **Example:** `Device(config)# router bgp 45000`	Enables a Border Gateway Protocol (BGP) process and enters router configuration mode.
Step 9	**table-map** *route-map-name* **Example:** `Device(config-router)# table-map rm1`	Modifies the metric and tag values when the IP routing table is updated with BGP learned routes.
Step 10	**exit** **Example:**	Exits router configuration mode and returns to global configuration mode.

	Command or Action	Purpose
	`Device(config-router)# exit`	
Step 11	**access-list** *access-list-number* {**permit** | **deny**} *source* **Example:** `Device(config)# access-list 69 permit 10.69.0.0`	Defines an access list.
Step 12	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 0/0/0`	Specifies the interfaces (or subinterface) and enters interface configuration mode.
Step 13	**bgp-policy** {**source** | **destination**} **ip-prec-map** **Example:** `Device(config-if)# bgp-policy source ip-prec-map`	Classifies packets using IP Precedence.
Step 14	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Monitoring QoS Policy Propagation via BGP

To monitor the QoS Policy Propagation via the BGP feature configuration, use the following optional commands.

Command or Action	Purpose
show ip bgp	Displays entries in the Border Gateway Protocol (BGP) routing table to verify whether the correct community is set on the prefixes.
show ip bgp community-list *community-list-number*	Displays routes permitted by the BGP community to verify whether correct prefixes are selected.
show ip cef *network*	Displays entries in the forwarding information base (FIB) table based on the specified IP address to verify whether Cisco Express Forwarding has the correct precedence value for the prefix.
show ip interface	Displays information about the interface.

Command or Action	Purpose
show ip route *prefix*	Displays the current status of the routing table to verify whether correct precedence values are set on the prefixes.

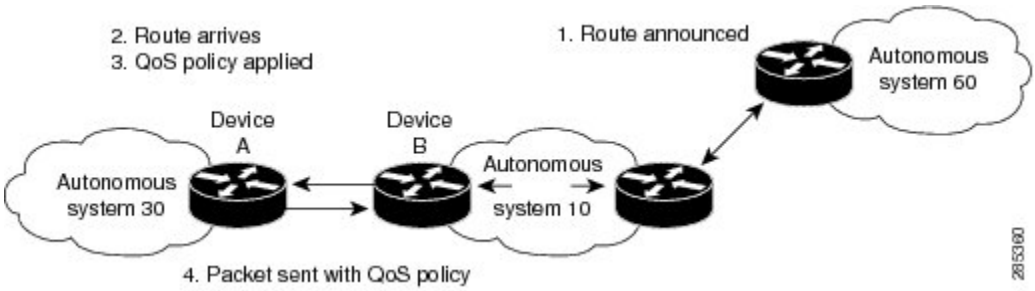
Configuration Examples for QoS Policy Propagation via BGP

Example: Configuring QoS Policy Propagation via BGP

The following example shows how to create route maps to match access lists, Border Gateway Protocol (BGP) community lists, and BGP autonomous system paths, and apply IP precedence to routes learned from neighbors.

In the figure below, Device A learns routes from autonomous system 10 and autonomous system 60. The quality of service (QoS) policy is applied to all packets that match defined route maps. Any packets from Device A to autonomous system 10 or autonomous system 60 are sent the appropriate QoS policy, as the numbered steps in the figure indicate.

Figure 1: Device Learning Routes and Applying QoS Policy



Device A Configuration

```
interface serial 5/0/0/1:0
ip address 10.28.38.2 255.255.255.0
bgp-policy destination ip-prec-map
no ip mroute-cache
no cdp enable
frame-relay interface-dlci 20 IETF
router bgp 30
 table-map precedence-map
 neighbor 10.20.20.1 remote-as 10
 neighbor 10.20.20.1 send-community
!
ip bgp-community new-format
!
! Match community 1 and set the IP precedence to priority
route-map precedence-map permit 10
 match community 1
 set ip precedence priority
!
! Match community 2 and set the IP precedence to immediate
route-map precedence-map permit 20
```

```
 match community 2
 set ip precedence immediate
!
! Match community 3 and set the IP precedence to flash
route-map precedence-map permit 30
 match community 3
 set ip precedence flash
!
! Match community 4 and set the IP precedence to flash-override
route-map precedence-map permit 40
 match community 4
 set ip precedence flash-override
!
! Match community 5 and set the IP precedence to critical
route-map precedence-map permit 50
 match community 5
 set ip precedence critical
!
! Match community 6 and set the IP precedence to internet
route-map precedence-map permit 60
 match community 6
 set ip precedence internet
!
! Match community 7 and set the IP precedence to network
route-map precedence-map permit 70
 match community 7
 set ip precedence network
!
! Match ip address access list 69 or match autonomous system path 1
! and set the IP precedence to critical
route-map precedence-map permit 75
 match ip address 69
 match as-path 1
 set ip precedence critical
!
! For everything else, set the IP precedence to routine
route-map precedence-map permit 80
 set ip precedence routine
!
! Define community lists
ip community-list 1 permit 60:1
ip community-list 2 permit 60:2
ip community-list 3 permit 60:3
ip community-list 4 permit 60:4
ip community-list 5 permit 60:5
ip community-list 6 permit 60:6
ip community-list 7 permit 60:7
!
! Define the AS path
ip as-path access-list 1 permit ^10_60
!
! Define the access list
access-list 69 permit 10.69.0.0
```

Device B Configuration

```
router bgp 10
 neighbor 10.30.30.1 remote-as 30
 neighbor 10.30.30.1 send-community
 neighbor 10.30.30.1 route-map send_community out
!
ip bgp-community new-format
!
```

```
! Match prefix 10 and set community to 60:1
route-map send_community permit 10
 match ip address 10
 set community 60:1
!
! Match prefix 20 and set community to 60:2
route-map send_community permit 20
 match ip address 20
 set community 60:2
!
! Match prefix 30 and set community to 60:3
route-map send_community permit 30
 match ip address 30
 set community 60:3
!
! Match prefix 40 and set community to 60:4
route-map send_community permit 40
 match ip address 40
 set community 60:4
!
! Match prefix 50 and set community to 60:5
route-map send_community permit 50
 match ip address 50
 set community 60:5
!
! Match prefix 60 and set community to 60:6
route-map send_community permit 60
 match ip address 60
 set community 60:6
!
! Match prefix 70 and set community to 60:7
route-map send_community permit 70
 match ip address 70
 set community 60:7
!
! For all others, set community to 60:8
route-map send_community permit 80
 set community 60:8
!
! Define access lists
access-list 10 permit 10.61.0.0
access-list 20 permit 10.62.0.0
access-list 30 permit 10.63.0.0
access-list 40 permit 10.64.0.0
access-list 50 permit 10.65.0.0
access-list 60 permit 10.66.0.0
access-list 70 permit 10.67.0.0
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases

Related Topic	Document Title
IP routing protocol-independent commands	Cisco IOS IP Routing: Protocol-Independent Command Reference
BGP configuration	*BGP Configuration Guide*
Cisco Express Forwarding configuration	*Cisco Express Forwarding Configuration Guide*
Committed access rate configuration	"Configuring Committed Access Rate" module in the *QoS: Classification Configuration Guide* (part of the Quality of Service Solutions Configuration Guide Library)
Weighted Random Early Detection configuration	"Configuring Weighted Random Early Detection" module in the *QoS: Congestion Avoidance Configuration Guide* (part of the Quality of Service Solutions Configuration Guide Library)

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 QoS Policy Propagation via BGP

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 QoS Policy Propagation via BGP

Feature Name	Releases	Feature Information
QoS Policy Propagation via BGP		The QoS Policy Propagation via BGP feature allows you to classify packets by IP precedence based on Border Gateway Protocol (BGP) community lists, BGP autonomous system paths, and access lists. After a packet has been classified, you can use other quality of service (QoS) features such as committed access rate (CAR) and Weighted Random Early Detection (WRED) to specify and enforce policies to fit your business model.
Policy Routing Infrastructure		The Policy Routing Infrastructure feature provides full support of IP policy-based routing with Cisco Express Forwarding (CEF). As CEF gradually obsoletes fast switching, policy routing is integrated with CEF to increase customer performance requirements. When policy routing is enabled, redundant processing is avoided.