



Configurable Queue Depth

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This feature allows you to configure (resize) the depth of the packet queues on your network. That is, you can set the maximum number (depth) of packets that a class queue can hold, which in turn controls when the router drops packets. Configuring the depth of the packet queues helps alleviate packet queue congestion.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the “[Feature Information for Configuring Queue Depth](#)” section on page 9.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

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

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Information About Configuring Queue Depth

Before configuring queue depth, you should understand the following concept:

- [Queue Limit, page 2](#)

Queue Limit

Each queue has a limit on the number of packets that the router can place into the queue. This limit, referred to as the *depth*, is a user-configurable limit. During periods of high traffic, a queue fills with packets waiting for transmission. When a queue reaches its queue limit and becomes full, by default, the router drops packets until the queue is no longer full.

[Table 1](#) describes the queuing limits for the various processor cards.

Table 1 **Packets Per Queue**

Processor	Cisco IOS Release	Packets Per Queue
PRE1	All releases	32 to 16384 If you do not specify a value that is a power of 2, the router uses the nearest power of 2.
PRE2	Cisco IOS Release 12.2(15)BX and Release 12.2(16)BX	32 to 16384 The value does not need to be a power of 2.
PRE2	Cisco IOS Release 12.3(7)XI and later releases	Interfaces With Speeds That Are Less Than 500 MB 8 to 4096 packets per queue The value must be a power of 2. Interfaces With Speeds That Are Greater Than 500 MB 128 to 64000 packets per queue The value must be a power of 2.
PRE3 PRE4	Cisco IOS Release 12.2(31)SB2 and later releases	16 to 32767

When a packet queue temporarily experiences congestion, increasing the depth of the queue using the **queue-limit** command reduces the number of packets dropped. However, setting the queue limit to a high value might reduce the number of packet buffers available to other interfaces.

The queue limit applies to each buddy queue on links with:

- At least 500 Mbps (PRE1)
- 1 Gbps (PRE2)



Note

The PRE3 does not use buddy queues.

If you do not specify a queue limit, the router calculates the default buffer size for each class queue as follows:

- Class queues with weighted random early detection (WRED)—The router uses the default queue limit of two times the largest WRED maximum threshold value, rounded to the nearest power of 2.

**Note**

For Cisco IOS Release 12.2(15)BX and Release 12.2(16)BX, the router does not round the value to the nearest power of 2.

- Class queues without WRED—The router has buffers for up to 50 milliseconds of 256-byte packets (PRE2) or 250-byte packets (PRE3) at line rate, but not less than 32 packets (PRE2) or 16 packets (PRE3).
- Priority queues without WRED—The router has buffers for up to 25 milliseconds of 80-byte packets at line rate, but not less than 32 packets (PRE2) or 16 packets (PRE3).

How to Configure Queue Depth

This section contains the following tasks:

- [Setting the Depth of a Traffic Class Queue, page 3](#) (required)
- [Verifying the Depth of the Traffic Class Queue, page 5](#) (optional)

Setting the Depth of a Traffic Class Queue

Setting the depth of a traffic class queue controls when the router drops packets (for example, using tail drop). To set the size of a class queue (that is, to configure the maximum number of packets that a class queue can hold), complete the following steps.

Queue-Limit Default Behavior

The following describes the default behavior of the **queue-limit** command for class queues with and without weighted random early detection (WRED):

- Class queues with weighted random early detection (WRED)—The router uses the default queue limit of two times the largest WRED maximum threshold value, rounded to the nearest power of 2.

**Note**

For Cisco IOS Release 12.2(15)BX and Release 12.2(16)BX, the router does not round the value to the nearest power of 2.

- Priority queues and class queues without WRED—The router has buffers for up to 50 milliseconds of 256-byte packets at line rate, but not less than 32 packets.

Prerequisites

The traffic classes, class maps, and policy maps must exist. To create traffic classes, class maps, and policy maps, use the Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC). For information about using the MQC, see the [“Applying QoS Features Using the MQC”](#) module.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **policy-map** *policy-map-name*
4. **class** *class-map-name*
5. **bandwidth** {*bandwidth-kbps* | **percent** *percent*}
6. **queue-limit** *number-of-packets*
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	policy-map <i>policy-map-name</i> Example: Router(config)# policy-map Policy1	Specifies the name of the policy map and enters policy-map configuration mode. <ul style="list-style-type: none"> Enter the policy map name. Names can be a maximum of 40 alphanumeric characters.
Step 4	class <i>class-map-name</i> Example: Router(config-pmap)# class Class1	Assigns the traffic class you specify to the policy map. Enters policy-map class configuration mode. <ul style="list-style-type: none"> Enter the name of a previously configured class map. This is the traffic class for which you want to enable QoS features.
Step 5	bandwidth { <i>bandwidth-kbps</i> percent <i>percent</i> }	Specifies the amount of bandwidth (in kbps or as a percentage of available bandwidth) to be assigned to the class. <ul style="list-style-type: none"> Enter the amount of bandwidth. The amount of bandwidth configured should be large enough to also accommodate Layer 2 overhead.
Step 6	queue-limit <i>number-of-packets</i> Example: Router(config-pmap-c)# queue-limit 32	Specifies or modifies the maximum number of packets that the queue can hold for this class. <ul style="list-style-type: none"> Enter the maximum number of packets as applicable. See the “Queue Limit” section on page 2. <p>Note If you do not specify <i>number-of-packets</i>, by default, the router uses the values described in the “Queue-Limit Default Behavior” section on page 3.</p>
Step 7	end Example: Router(config-pmap-c)# end	(Optional) Exits policy-map class mode.

Verifying the Depth of the Traffic Class Queue

To verify the depth of the traffic class queue (and to determine whether the packets are being managed as anticipated), perform the following steps.

SUMMARY STEPS

1. **enable**
2. **show policy-map interface** *type number*
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	show policy-map interface <i>type number</i> Example: Router# show policy-map interface serial4/0	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface. <ul style="list-style-type: none"> • Enter the interface type and number.
Step 3	exit Example: Router# exit	(Optional) Exits privileged EXEC mode.

Configuration Examples for Configuring Queue Depth

This section provides the following configuration examples:

- [Setting the Queue Size: Example, page 5](#)
- [Verifying the Queue Size: Example, page 6](#)

Setting the Queue Size: Example

The following example shows how to create a policy map named Policy1 that contains two classes named Class1 and Class2. The Class1 configuration enable a specific bandwidth allocation and specifies the maximum number of packets that can be queued for the class. Because Class1 limits the number of packets that can be held in the queue to 32, the router uses tail drop to drop packets when that limit is reached. Class2 enables bandwidth allocation only.

```
Router(config)# policy-map Policy1
Router(config-pmap)# class Class1
Router(config-pmap-c)# bandwidth 3000
Router(config-pmap-c)# queue-limit 32
Router(config-pmap-c)# exit
```

```
Router(config-pmap)# class Class2
Router(config-pmap-c)# bandwidth 2000
Router(config-pmap-c)# end
```

Verifying the Queue Size: Example

Use the **show policy-map interface** command to display traffic statistics for the class maps, policy maps, and traffic queues on your network.

The following is sample output for the **show policy-map interface** command. In this example, the policy map named Traffic-5-PR is attached to serial interface 1/0/0 and includes three traffic classes. The Voice-5-PR class has a configured queue limit of 32 packets with 0 packets dropped. The Gold-5-PR class also indicates that no packets dropped. The Silver-5-PR class has a configured queue limit of 64 packets with 0 packets dropped.

```
Router# show policy-map interface serial 1/0/0

Serial1/0/0

Service-policy output: Traffic-Parent (1051)

Class-map: class-default (match-any) (1068/0)
 2064335 packets, 120273127 bytes
 5 minute offered rate 1000 bps, drop rate 0 bps
Match: any (1069)
 126970 packets, 3982597 bytes
 5 minute rate 0 bps
Shape : 6000 kbps

Service-policy : Traffic-5-PR (1052)

Class-map: Voice-5-PR (match-all) (1053/1)
 82310 packets, 4938600 bytes
 5 minute offered rate 0 bps, drop rate 0 bps
Match: ip precedence 5 (1054)
Output queue: 0/32; 82310/4938600 packets/bytes output, 0 drops
Absolute priority
Queue-limit: 32 packets
Police:
 304000 bps, 1536 limit, 0 extended limit
 conformed 82312 packets, 4938720 bytes; action: transmit
 exceeded 0 packets, 0 bytes; action: drop
 violated 0 packets, 0 bytes; action: drop

Class-map: Gold-5-PR (match-any) (1058/2)
 1125476 packets, 67528560 bytes
 5 minute offered rate 0 bps, drop rate 0 bps
Match: ip precedence 3 4 (1059)
 1125476 packets, 67528560 bytes
 5 minute rate 0 bps
Output queue: 0/128; 1125503/67530180 packets/bytes output, 0 drops
Bandwidth : 188 kbps (Weight 3)

Class-map: Silver-5-PR (match-any) (1061/3)
 697908 packets, 41874480 bytes
 5 minute offered rate 0 bps, drop rate 0 bps
Match: ip precedence 0 1 2 (1062)
 697908 packets, 41874480 bytes
 5 minute rate 0 bps
Output queue: 0/64; 697919/41875140 packets/bytes output, 0 drops
```

```

Bandwidth : 71 kbps (Weight 1)
Random-detect (precedence-based):
  Exponential weight: 9 (1/512)
  Current average queue length: 0 packets
-----
          Min   Max Prob   Rand-Drops Tail-Drops
-----
          0    16   32 1/10           0           0
          1    18   32 1/10           0           0
          2    20   32 1/10           0           0
          3    22   32 1/10           0           0
          4    24   32 1/10           0           0
          5    26   32 1/10           0           0
          6    28   32 1/10           0           0
          7    30   32 1/10           0           0
Queue-limit: 64 packets

Class-map: class-default (match-any) (1066/0)
158641 packets, 5931487 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: any (1067)
  158641 packets, 5931487 bytes
  5 minute rate 0 bps
Output queue: 0/128; 31672/1695625 packets/bytes output, 0 drops

```

Additional References

The following sections provide references related to configuring queue depth.

Related Documents

Related Topic	Document Title
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	Cisco IOS Quality of Service Solutions Command Reference
Congestion management concepts and related topics	“Congestion Management Overview” module
Packet classification	“Classifying Network Traffic” module
Creating classes, class maps, and policy maps	“Applying QoS Features Using the MQC” module
WRED	“Configuring Weighted Random Early Detection” module

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/techsupport

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS Quality of Service Solutions Command Reference* at http://www.cisco.com/en/US/docs/ios/qos/command/reference/qos_book.html. For information about all Cisco IOS commands, use the Command Lookup Tool at <http://tools.cisco.com/Support/CLILookup> or the *Cisco IOS Master Command List, All Releases*, at http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html.

- **queue-limit**

Feature Information for Configuring Queue Depth

Table 2 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

**Note**

Table 2 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

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