

Weighted Random Early Detection on the Cisco 12000 Series Router

Random Early Detection (RED) is a congestion avoidance mechanism that takes advantage of TCP's congestion control mechanism. By randomly dropping packets prior to periods of high congestion, RED tells the packet source to decrease its transmission rate. Assuming the packet source is using TCP, it will decrease its transmission rate until all the packets reach their destination, indicating that the congestion is cleared.

Weighted RED (WRED) generally drops packets selectively based on IP precedence. Packets with a higher IP precedence are less likely to be dropped than packets with a lower precedence. Thus, higher priority traffic is delivered with a higher probability than lower priority traffic. However, you can also configure WRED to ignore IP precedence when making drop decisions so that non-weighted RED behavior is achieved.

WRED is useful on any output interface where you expect to have congestion. However, WRED is usually used in the core routers of a network, rather than the edge. Edge routers assign IP precedences to packets as they enter the network. WRED uses these precedences to determine how it treats different types of traffic.

The Release 11.2 GS version of WRED differs from the previously existing RSP-based version of WRED. All WRED processing takes place on the line card, rather than using the route processor card. In addition, no default configuration values are supplied for WRED parameters—with one exception where a default exponential-weight parameter is derived from supplied class of service (COS) values. In general, you must provide values for all configurable parameters.

This document describes only the Release 11.2 GS version of WRED. Refer to the Cisco IOS Release 11.3 *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* for information on the RSP version of WRED.

Benefits

When RED is not configured, output buffers fill during periods of congestion. When the buffers are full, tail drop occurs; all additional packets are dropped. Since the packets are dropped all at once, global synchronization of TCP hosts can occur as multiple TCP hosts reduce their transmission rates. The congestion clears, and the TCP hosts increase their transmission rates, resulting in waves of congestion followed by periods where the transmission link is not fully used.

RED reduces the chances of tail drop by selectively dropping packets when the output interface begins to show signs of congestion. By dropping some packets early rather than waiting until the buffer is full, RED avoids dropping large numbers of packets at once and minimizes the chances of global synchronization. Thus, RED allows the transmission line to be used fully at all times.

In addition, RED statistically drops more packets from large users than small. Therefore, traffic sources that generate the most traffic are more likely to be slowed down than traffic sources that generate little traffic.

WRED provides separate thresholds and weights for different IP precedences, allowing you to provide different qualities of service for different traffic. Standard traffic may be dropped more frequently than premium traffic during periods of congestion.

List of Terms

COS—Class of service.

DWRED—Distributed WRED, the implementation of WRED on the Cisco 12000 series router. DWRED performs all of the functions of WRED, but all processing takes place on the line card rather than using the GSR route processor (GRP). In other words, WRED processing is distributed to the line cards that have WRED configured.

DRR—Distributed round robin.

GRP—GSR route processor.

GSR—Gigabit Switch Router.

RED—Random Early Detection.

WRED—Weighted RED.

Restrictions

WRED has the following restrictions:

- WRED is only useful when the bulk of the traffic is TCP/IP traffic. With TCP, dropped packets indicate congestion, so the packet source will reduce its transmission rate. With other protocols, packet sources may not respond or may resend dropped packets at the same rate. Thus, dropping packets does not decrease congestion.
- WRED treats non-IP traffic as precedence 0, the lowest precedence. Non-IP traffic will be dropped more often than IP traffic.
- WRED is only available on a per-interface basis. You cannot configure WRED on a subinterface.

Note All interfaces on a line card may flap (go down and up) when you configure WRED the first time on any interface, and when you remove WRED configuration from all interfaces on the line card. There is no flap, however, if you configure WRED and it is already configured on another interface on the line card.

- WRED is not supported with the ATM encapsulations AAL5-MUX.
- DRR support is not implemented in the initial release of the RED/WRED feature in Cisco IOS Release 11.2 GS software.

Platforms

This feature is supported on the following Cisco 12000 series routers:

- Cisco 12012 series
- Cisco 12008 series

Prerequisites

In order to use WRED, Distributed Cisco Express Forwarding switching must be enabled on the interface. Refer to the Cisco Express Forwarding feature documentation for configuration information.

Supported MIBs and RFCs

This feature is not yet supported in the CISCO-WRED-MIB.

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB website on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

No RFCs are supported by this feature.

Functional Description

When a packet arrives, the following events occur:

- The average queue size is calculated. See the "Average Queue Size" section for details.
- If the average is less than the minimum queue threshold, the arriving packet is queued.
- If the average is between the minimum queue threshold and the maximum threshold, the packet is either dropped or queued, depending on the packet drop probability. See the "Packet-Drop Probability" section for details.
- If the average queue size is greater than the maximum threshold, the packet is automatically dropped.

Average Queue Size

The average queue size is based on the previous average and the current size of the queue. The formula is

$$\text{average} = (\text{old_average} * (1 - 1/2^n)) + (\text{current_queue_size} * 1/2^n)$$

where n is the exponential weight factor, a user-configurable value.

For high values of n, the previous average becomes more important. A large factor smooths out the peaks and lows in queue length. The average queue size is unlikely to change very quickly, avoiding drastic swings in size. The WRED process will be slow to start dropping packets, but it may continue dropping packets for a time after the actual queue size has fallen below the minimum threshold. The slow-moving average will accommodate temporary bursts in traffic.

If the value of n gets too high, WRED will not react to congestion. Packets will be transmitted or dropped as if WRED were not in effect.

For low values of n , the average queue size closely tracks the current queue size. The resulting average may fluctuate with changes in the traffic levels. In this case, the WRED process responds quickly to long queues. Once the queue falls below the minimum threshold, the process will stop dropping packets.

If the value of n gets too low, WRED will overreact to temporary traffic bursts and drop traffic unnecessarily.

Packet-Drop Probability

The packet drop probability is based on the minimum threshold, maximum threshold, and mark probability denominator.

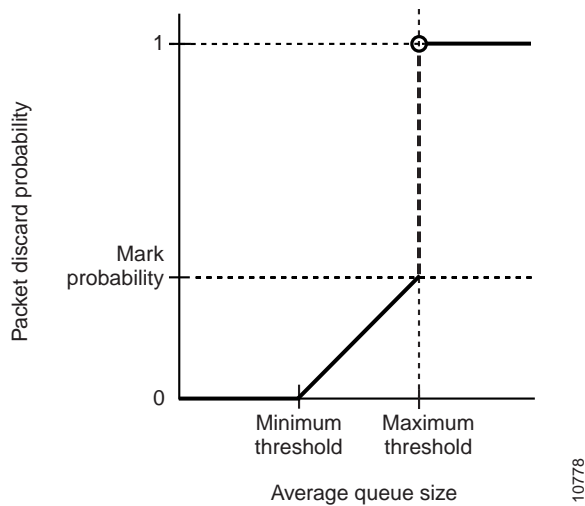
When the average queue depth is above the minimum threshold, RED starts dropping packets. The rate of packet drop increases linearly as the average queue size increases until the average queue size reaches the maximum threshold.

The mark probability denominator is the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, one out of every 512 packets is dropped when the average queue is at the maximum threshold.

When the average queue size is above the maximum threshold, all packets are dropped.

Figure 1 summarizes the packet drop probability.

Figure 1 WRED Packet Drop Probability



The minimum threshold value should be set high enough to maximize the link utilization. If the minimum threshold is too low, packets may be dropped unnecessarily, and the transmission link will not be fully used.

The difference between the maximum threshold and the minimum threshold should be large enough to avoid global synchronization. If the difference is too small, many packets may be dropped at once, resulting in global synchronization.

Implementation

The implementation for RED/DRR differs based upon the different card types. The following describes the implementation, from a high level, for the different line cards on the GSR.

OC-12 Type Line Cards

The following line cards, in general, will handle RED/DRR in a similar manner.

- Quad OC3
- OC12 POS
- OC12 ATM
- Quad OC3 ATM
- Channelized OC12

Receive (Rx) Side

The line card can transmit to the switching fabric, up to 16 destination slots. Each destination slot has up to 8 COS queues assigned to the switching fabric, giving a total of 128 COS queues. There are 8 COS queues for IP multicast traffic. The COS queues can be configured independently from one another. The RED parameters can be configured on a per slot/per IP precedence value.

Transmit (Tx) Side

The line card has 8 COS queues per interface. Each interface COS set of queues can be configured independently. The RED parameters can be configured on a per interface/per IP precedence value.

OC-48 Type Line Cards

The Quad OC12 and OC48 high performance cards handle RED/DRR in hardware. The following describes its implementation.

Receive (Rx) Side

The line card has a set of eight COS queues per destination interface. With 16 potential slots, and 16 interfaces per slot, the maximum number of COS queues is 2048. (16 slots, 16 interfaces per slot, 8 queues per interface). The configuration parameters for RED/DRR for these queues are grouped by destination slot. In other words, each destination slot will use the same parameters for all COS queues allocated for all interfaces in that slot will be the same.

Transmit (Tx) Side

The line card has eight COS queues per transmit interface. Each set of queues for that interface can be configured independently.

Line Cards Supporting WRED/RED Only

Due to performance considerations, the following line cards should run RED and not DRR:

Implementation

- QOC-12c/STM-4c line card, 4OC12c/STM-4c POS-IR-SC(=), 4OC12c/STM-4c POS-MM-SC(=)
- OC-48c/STM-16c line card, OC48/POS-SR-SC(=), OC48/POS-SR-FC(=)
- Gigabit Ethernet, GE-SX/LH-SC (=)
- 8-port Fast Ethernet, 8FE-FX-SC(=), 8FE-TX-RJ45(=)

Configuration Tasks

To configure WRED on an interface, perform the following tasks. The first and second tasks are required. You must perform either the third or the fourth task.

- Configure a COS Queue Group Template
- Configure Queue Group Values
- Configure RED for the Transmit Queues
- Configure RED for the To Fabric Queues

Configure a COS Queue Group Template

You create a COS queue group template to group together RED/WRED/DRR parameters that you want linked to different queues. The queue group lets you establish, say, two basic WRED parameter settings that you can apply to many different COS queues. By using a queue group, you need not reconfigure each interface and COS queue separately.

To configure a COS queue group template, perform the following task in global configuration mode:

Task	Command
Create a queue group template and enter COS queue group configuration mode.	cos-queue-group <i>name</i>

Configure Queue Group Values

To configure queue group values, perform the following task in COS queue group configuration mode:

Task	Command
Set the weight used in calculating the average queue depth for this COS queue group.	exponential-weighting-constant <i>number</i>
Map packets that have a particular IP precedence to a RED profile in this cos-queue-group.	precedence { <i>number</i> all } random-detect-label <i>label</i>
Set RED drop criteria.	random-detect-label <i>label</i> <i>minimum-threshold</i> <i>maximum-threshold</i> <i>mark-probability</i>
Set default values for the COS queue group.	default

The *minimum-threshold*, *maximum-threshold* and *mark-probability* parameters describe the actual RED curve. When the weighted queue average is below the minimum threshold, no packets will be dropped. When the weighted queue average is above the maximum queue threshold, all packets will be dropped until the average drops below the maximum threshold. When the average is between the minimum and the maximum thresholds, the probability that the packet is going to be dropped can be calculated by a straight line from the minimum threshold to the maximum threshold.

Configure RED for the Transmit Queues

Each COS interface queue can be configured independently. The RED parameters can be configured on a per-interface/per-IP precedence value.

To configure RED for the transmit link queues, perform the following task in interface configuration mode:

Task	Command
Associate a COS queue group name with the transmit queues on this interface.	tx-cos <i>name</i>

Configure RED for the To Fabric Queues

A line card sends packets to the switching fabric, addressing up to 16 destination slots. Depending on the line card type, a total of 128 queues (16 slots with 8 queues) or 2048 queues (16 slots, 16 interfaces per slot, 8 queues per interface) are available. In addition, there are eight COS queues for IP multicast traffic. Each COS queue can be configured independently. The RED parameters can be configured on a per-slot/per-IP precedence values.

Note You can configure a maximum of eight COS queues and one IP multicast COS queue on a line card. For line cards that support 2048 queues, COS queue parameters apply to all interfaces on a particular destination slot.

To configure RED for the to fabric queues, perform the following tasks, beginning in global configuration mode:

Task	Command
Define a slot table name and enter slot table configuration mode.	slot-table-cos <i>name</i>
Define destination slot parameters for this slot table name.	destination-slot { <i>number</i> all } <i>name</i>
Define multicast parameters for this slot table name.	multicast <i>name</i>
Exit slot table name configuration mode and return to global configuration mode.	exit
Link the slot-table-cos template to the line card where you want RED performed.	rx-cos-slot { <i>number</i> all } <i>name</i>

Change WRED Parameters

The default value for WRED exponential-weighting-constant is 1/2. This default is used in a COS queue group, when a **random-detect-label** is configured and associated with IP precedence levels, using the **precedence** command. Therefore, there is a default value for exponential-weighting-constant only if other WRED configuration exists for that COS queue group.

When you enable WRED with the **random-detect** command, you can optionally configure all values. See “Choosing Random Detect Label WRED Parameters” for additional information on choosing values.

To change WRED parameters, perform one of the following tasks in interface configuration mode:

Task	Command
Configure the weight factor used in calculating the average queue length.	random-detect exponential-weighting-constant <i>exponent</i>
Configure parameters for packets with a specific IP precedence. Repeat this command for each precedence. To configure RED, rather than WRED, use the same parameters for each precedence.	random-detect precedence <i>precedence min-threshold max-threshold mark-prob-denominator</i>

Choosing Random Detect Label WRED Parameters

The following information how to select starting values for the WRED configuration parameters when using various link speeds, such as DS3, OC3, or OC12.

Selecting the Exponential-weighting-constant

Table 1 lists the values to use as a starting point for exponential-weighting-constant values if you decide to configure the WRED parameters.

The default value for WRED exponential-weighting-constant is 1/2. This default is used in a COS queue group, when a **random-detect-label** is configured and associated with IP precedence levels, using the **precedence** command.

Table 1 Exponential-weighting-constant Values

Link Speed	Exponential-weighting-constant
DS3	9
OC3	10
OC12	12

The basic formula for establishing a starting value is as follows:

$$\text{exponential-weighting-constant} = 10/B$$

where B is the output link bandwidth in MTU-sized packets. We suggest that you use 1500 byte packets for the MTU even if you have MTU configured at 4470. For an OC3 link, the bandwidth (B) is determined as follows:

$$B = 155\text{Mbps} / (8\text{bits/byte}) / 1500 (\text{bytes/packet}) = 12917$$

For the following link speeds, B is

Link Speed	B
DS3	3666
OC3	12917
OC12	51666

Continuing with calculating the value for an OC3 link results in the following:

$$\text{exponential-weighting-constant} = 10/B = 7.7419 \text{ E-4 for oc3}$$

The exponential-weighting-constant is configured as a negative power of 2:

$$7.7419 \text{ E-4} \approx 2^{-10}$$

This result, approximately 2^{-10} , gives the configuration value “10” for the exponential-weighting-constant.

Selecting the Minimum Threshold

A starting point for selecting the minimum threshold is to choose a value that is approximately 0.03 B. Table 2 shows the minimum threshold values for various link speeds.

Table 2 Minimum Threshold Values

Link Speed	Min Threshold
DS3	110
OC3	388
OC12	1550

Selecting the Maximum Threshold

A starting point for selecting the maximum threshold is to choose a value that is approximately 0.1 B. Table 3 shows the minimum threshold values for various link speeds.

Table 3 Maximum Threshold Values

Ink Speed	Max Threshold
DS3	367
OC3	1292
OC12	5167

Selecting the Maximum Probability

The maximum probability value should be set to “1.”

Configuration Examples

The following configuration example defines a COS transmit queue group template named **oc3-tx** on a POS interface:

```
Router# conf t
Router(config)# cos-queue-group oc3-tx
Router(config-cos-que)# cos-queue-group oc3-tx
```

The following configuration example defines **ds3-tx** queue group for a DS3 interface and uses precedence and random-detect-label commands to configure the WRED parameters:

```
interface Serial8/2
 ip address 10.1.1.1 255.255.0.0
 no ip directed-broadcast
 rate-limit output 5000000 30000 1000000 conform-action transmit
 exceed-action drop
 no ip mroute-cache
 clock source internal
 tx-cos ds3-tx
!
!
cos-queue-group ds3-tx
 precedence 0 random-detect-label 0
 precedence 1 random-detect-label 1
 precedence 2 random-detect-label 2
 precedence 3 random-detect-label 3
 precedence 4 random-detect-label 4
 precedence 5 random-detect-label 5
 precedence 6 random-detect-label 6
 precedence 7 random-detect-label 6
 random-detect-label 0 110 367 1
 random-detect-label 1 150 500 2
 random-detect-label 2 250 600 3
 random-detect-label 3 350 700 4
 random-detect-label 4 450 800 5
 random-detect-label 5 550 900 6
 random-detect-label 6 650 1000 7
 exponential-weighting-constant 9
!
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.2 command references.

- **clear cos**
- **clear counters**
- **cos-queue-group**
- **destination-slot**
- **exponential-weighting-constant**
- **multicast**
- **precedence**
- **random-detect-label**
- **rx-cos-slot**
- **show cos statistics**
- **show interfaces pos random-detect**
- **slot-table-cos**
- **tx-cos**

clear cos

Use the **clear cos** EXEC command to clear the statistics displayed in the **show cos statistics** EXEC command.

```
clear cos
```

Syntax Description

This command has no keywords or arguments.

Default

None

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Example

The following example clears the COS statistics:

```
clear cos
```

Related Commands

show cos statistics

clear counters

Use the **clear counters** EXEC command to do something.

```
clear counters [ type slot/port]
```

Syntax Description

type (Optional) Interface type.

slot (Optional) Slot number.

port (Optional) Port number.

Default

None

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Example

The following example clears the counters for the POS interface at slot 4, port 0:

```
clear counters pos 4/0
```

Related Commands

show cos statistics

clear cos

cos-queue-group

Use the **cos-queue-group** global configuration command to define a queue-group label and template definition. Use the **no** form of this command to remove a queue-group template definition.

[no] cos-queue-group *name*

Syntax Description

name Label for the queue-group template.

Default

None

Command Mode

Global

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

The **cos-queue-group** command places you in queue-group configuration mode where you can enter the following commands:

- **exponential-weighting-constant**
- **precedence**
- **random-detect-label**

Example

The following example defines the queue-group label oc3-tx and places you in queue-group configuration mode. The router prompts are shown for clarity:

```
router (conf) # cos-queue-group oc3-tx
router (config-cos-que) #
```

Related Commands

exponential-weighting-constant
precedence
random-detect-label
tx-cos

destination-slot

Use the **destination slot** slot-table configuration command to define the to-fabric slot parameters.

```
destination slot { number [ all | name ] }
```

Syntax Description

all	All destination slots use the named profile.
<i>number</i>	Slot number that uses the named profile.
<i>name</i>	Name of the profile.

Default

None

Command Mode

Slot-table

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Use this command define which cos-queue-group's are linked to which "to fabric" queues.

Example

The following example links the cos-queue-group "oc3-oc12-cos" to the "to fabric" queue that goes to slot 5:

```
destination-slot 5 oc3-oc12-cos
```

The following example specifies all destination slots use the same drop profile:

```
destination-slot all oc3-oc12-cos
```

Related Commands

slot-table-cos

rx-cos-slot

exponential-weighting-constant

Use the **exponential-weighting-constant** static COS queue configuration command to set set the COS queue group RED exponential weight constant. Use the **no** form of the command to unset the value.

[no] exponential-weighting-constant *number*

Syntax Description

number A number in the range of 0 to 16.

Default

The default vaule is 1/2.

Command Mode

Static COS queue

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

The default value, 1/2, is used in a COS queue group when a **random-detect-label** is configured and associated with IP precedence levels, using the **precedence** command. Therefore, there is a default value for exponential-weighting-constant only if other WRED configuration exists for that COS queue group

Example

The following example sets the exponential-weighting-constant value to 10:

```
exponential-weighting-constant 10
```

Related Commands

random-detect-label
precedence

multicast

Use the **multicast** static COS queue configuration command to link a COS queue group with the line card multicast queue. Use the no form of the command to unlink the queue group.

[no] multicast *name*

Syntax Description

name Name of the COS queue group.

Default

None

Command Mode

Static COS queue

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Example

The following example links a cos-queue-group to the line card multicast queue:

```
multicast oc3-multicastcommand
```

Related Commands

slot-table-cos

precedence

Use the **precedence** static COS queue configuration command to map packets that have a particular IP precedence to a RED profile in the current cos-queue-group. Use the no form of the command to unmap the IP precedence.

```
[no] precedence { number | all } random-detect-label label
```

Syntax Description

<i>number</i>	A number in the range of 0 to 7. The number matches a corresponding IP precedence level.
all	Map all IP precedence levels to a particular random detect label.
<i>label</i>	A number in the range of 0 to 6. The number is associated with the values defined by the random-detect-label configuration comment.

Default

None

Command Mode

Static COS queue

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

You can map several or all precedences to the same RED profile, defined by the random-detect-label command. If no values are configured, precedence values are mapped so that they are not dropped.

Example

The following example associates IP precedence levels 0 and 1 to the drop values assigned to random detect label 5 for the COS queue group **ds3-tx**:

```
cos-queue-group ds3-tx
  precedence 0 random-detect-label 5
  precedence 1 random-detect-label 5
  random-detect-label 5 450 800 5
  exponential-weighting-constant 9
```

Related Commands

cos-queue-group
random-detect-label

random-detect-label

Use the **random-detect-label** static COS queue configuration command to configure the packet drop characteristics. Use the no form of the command to delete the values for a particular label number.

[no] random-detect-label *label minimum-threshold maximum-threshold mark-probability*

Syntax Description

<i>label</i>	A number in the range of 0 to 6 that associates this set of values to a particular IP precedence value.
<i>minimum-threshold</i>	A number in the range of 1 to 65535.
<i>maximum-threshold</i>	A number in the range of 1 to 65535.
<i>mark-probability</i>	A number in the range of 1 to 65535.

Default

None

Command Mode

Static COS queue

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

The minimum, maximum and mark probability parameters describe the actual RED curve. When the weighted queue average is below the minimum threshold no packets will be dropped. When the weighted queue average is above the maximum queue threshold, all packets will be dropped until the average drops below the maximum threshold. When the average is between the minimum and the maximum thresholds, the probability that the packet is going to be dropped can be calculated by a straight line from the minimum threshold.

Note All interfaces on a line card may flap (go down and up) when you configure WRED the first time on any interface, and when you remove WRED configuration from all interfaces on the line card. There is no flap, however, if you configure WRED and it is already configured on another interface on the line card.

Example

The following example defined random detect label 5 and the IP precedence levels 0 and 1 are associated to this label for the COS queue group **ds3-tx**:

```
cos-queue-group ds3-tx
  precedence 0 random-detect-label 5
  precedence 1 random-detect-label 5
  random-detect-label 5 450 800 5
  exponential-weighting-constant 9
```

Related Commands

cos-queue-group

precedence

rx-cos-slot

Use the **rx-cos-slot** global configuration command to link a particular “to fabric” COS slot table definition to a line card slot on the Cisco 12000 series router. Use the **no** form of the command to remove the link.

```
[no] rx-cos-slot { number | all } name
```

Syntax Description

<i>number</i>	A number in the range of 0 to 15 that corresponds to a physical card cage slot location.
all	Use the following name for all line cards that provide a “to fabric” data path.
<i>name</i>	The name of slot-table-cos definition.

Default

None

Command Mode

Global configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

You must first define a slot-table-cos template that you can link to the line card where WRED is performed.

Example

The following example links the “to fabric” queues on the line card in slot 2 with the cos-queue-groups as defined on the slot-table-cos **oc3-table**:

```
rx-cos-slot 2 oc3-table
```

Related Commands

slot-table-cos

show cos statistics

Use the **show cos statistics** EXEC command to display statistics that are associated with “to fabric” statistics on the line card.

show cos statistics [*number*]

Syntax Description

number (Optional) The slot number where the line card is located.

Default

None

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Example

The following example displays COS “to fabric” statistics:

```
Router# show cos statistics
Slot 2
  Dest slot 7 queue average: 0.061 average, 0.061 high water mark
drops per label 0: 1 random, 0 threshold
drops per label 1: 0 random, 0 threshold
drops per label 2: 0 random, 0 threshold
drops per label 3: 0 random, 0 threshold
drops per label 4: 0 random, 0 threshold
drops per label 5: 0 random, 0 threshold
drops per label 6: 0 random, 0 threshold
  Precedence 0: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 1: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 2: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 3: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 4: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 5: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 6: 1 min threshold, 10 max threshold, 1/1 mark weight
  Precedence 7: 1 min threshold, 10 max threshold, 1/1 mark weight
weight 1/32
```

The example display shows drops on the queue destination for slot 7. This command shows random and threshold drops broken down to the individual random-detect-labels.

Use the **clear cos** command to clear the statistics.

Related Commands

clear cos

show interfaces pos random-detect

Use the **show interfaces pos random-detect** EXEC command to view the actual average queue sizes and the number of packets dropped.

show interfaces *slot/port* pos random-detect

Syntax Description

slot The slot number.

port The port number.

Default

None

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

This command shows how the random detect parameters are configured, in addition to showing the drop statistics.

Use the **clear cos** command to clear the statistics.

Example

The following displays the random detect statistics for the line card interface at slot 2, port 0:

```
Router# show interfaces pos 2/0 random-detect
  POS2/0 queue average: 0.000 average, 0.000 high water mark
drops: 0 tx-queue-limit
drops per label 0: 0 random, 0 threshold
drops per label 1: 0 random, 0 threshold
drops per label 2: 0 random, 0 threshold
drops per label 3: 0 random, 0 threshold
drops per label 4: 0 random, 0 threshold
drops per label 5: 0 random, 0 threshold
drops per label 6: 0 random, 0 threshold
  Precedence 0: not configured for drop
  Precedence 1: 1000 min threshold, 4000 max threshold, 1/10 mark weight
  Precedence 2: 1000 min threshold, 4000 max threshold, 1/10 mark weight
  Precedence 3: 1000 min threshold, 4000 max threshold, 1/10 mark weight
  Precedence 4: 1000 min threshold, 4000 max threshold, 1/10 mark weight
  Precedence 5: 1000 min threshold, 4000 max threshold, 1/10 mark weight
  Precedence 6: 1000 min threshold, 4000 max threshold, 1/10 mark weight
  Precedence 7: 1000 min threshold, 4000 max threshold, 1/10 mark weight
weight 1/32
```

Table 4 describes the important fields of the example output.

Table 4 Show Interfaces POS Random-detect Field Descriptions

Field	Description
POS2/0 queue average	The current weighted average queue depth and the highest weighted average queue sampled.
drops: 0 tx-queue-limit	Drops that occurred because of the instantaneous queue depth hitting the tx-queue-limit, if configured.
drops per label:	The label identifier.
random:	Drops that occurred when the average queue depth was between the min and max thresholds.
threshold:	Drops that occurred when the average queue depth was above the maximum threshold.
Precedence	IP precedence and WRED weight used for the calculation of the weighted average queue depth.

Related Commands

clear cos

slot-table-cos

Use the **slot-table-cos** global configuration command to define a slot table name and enter slot table configuration mode.

slot-table-cos *name*

Syntax Description

name COS slot table name.

Default

None

Command Mode

Mode

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

The **slot-table-cos** command minimizes the amount of configuration required to set up WRED parameters for a destination line card slot. You define slot table queue group, by name, after which you can link the template to the destination line card slot.

After you enter slot table configuration mode with this command, you can define destination slot parameters and multicast WRED parameters.

Example

The following example defines a template named oc3-table and enters slot table configuration mode:

```
slot-table-cos oc3-table
```

Related Commands

destination-slot
multicast

tx-cos

Use the **tx-cos** interface configuration command to associate a COS queue group name with the transmit queues on this interface. Use the **no** form of the command to remove a COS queue group name.

[no] tx-cos *name*

Syntax Description

name The name of the cos-queue-group definition

Default

None

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Use this command to link a previously defined transmit queue group to the interface. Use the **cos-queue-group** global configuration command to define a queue-group label and template definition.

Example

The following example associates the queue-group template oc3-tx to the POS interface in slot 2:

```
int pos 2/0
tx-cos oc3-tx
```

Related Commands

cos-queue-group

