

rate-limit

To configure committed access rate (CAR) and distributed CAR (DCAR) policies, use the **rate-limit** interface configuration command. To remove the rate limit from the configuration, use the **no** form of this command.

rate-limit {input | output} [dscp dscp-value] [access-group [rate-limit] acl-index] bps
burst-normal burst-max conform-action conform-action exceed-action exceed-action

no rate-limit {input | output} [dscp dscp-value] [access-group [rate-limit] acl-index] bps
burst-normal burst-max conform-action conform-action exceed-action exceed-action

Syntax Description

input	Applies this CAR traffic policy to packets received on this input interface.
output	Applies this CAR traffic policy to packets sent on this output interface.
dscp	(Optional) Allows the rate limit to be applied to any packet matching a specified differentiated services code point (DSCP).
<i>dscp-value</i>	(Optional) The DSCP number; values are 0 to 63.
access-group	(Optional) Applies this CAR traffic policy to the specified access list.
rate-limit	(Optional) The access list is a rate-limit access list.
<i>acl-index</i>	(Optional) Access list number.
<i>bps</i>	Average rate, in bits per second (bps). The value must be in increments of 8 kbps.
<i>burst-normal</i>	Normal burst size, in bytes. The minimum value is bps divided by 2000.
<i>burst-max</i>	Excess burst size, in bytes.
conform-action <i>conform-action</i>	Action to take on packets that conform to the specified rate limit. Specify one of the following keywords: continue—Evaluates the next rate-limit command. drop—Drops the packet. set-dscp-continue—Sets the differentiated services code point (DSCP) (0 to 63) and evaluates the next rate-limit command. set-dscp-transmit—Sends the DSCP and transmits the packet. set-mpls-exp-continue—Sets the MPLS experimental bits (0 to 7) and evaluates the next rate-limit command. set-mpls-exp-transmit—Sets the MPLS experimental bits (0 to 7) and sends the packet. set-prec-continue—Sets the IP precedence (0 to 7) and evaluates the next rate-limit command. set-prec-transmit—Sets the IP precedence (0 to 7) and sends the packet. set-qos-continue—Sets the QoS group ID (1 to 99) and evaluates the next rate-limit command. set-qos-transmit—Sets the QoS group ID (1 to 99) and sends the packet. transmit—Sends the packet.

exceed-action <i>exceed-action</i>	Action to take on packets that exceed the specified rate limit. Specify one of the following keywords: • continue—Evaluates the next rate-limit command. • drop—Drops the packet. • set-dscp-continue—Sets the DSCP (0 to 63) and evaluates the next rate-limit command. • set-dscp-transmit—Sends the DSCP and sends the packet. • set-mpls-exp-continue—Sets the MPLS experimental bits (0 to 7) and evaluates the next rate-limit command. • set-mpls-exp-transmit—Sets the MPLS experimental bits (0 to 7) and sends the packet. • set-prec-continue—Sets the IP precedence (0 to 7) and evaluates the next rate-limit command. • set-prec-transmit—Sets the IP precedence (0 to 7) and sends the packet. • set-qos-continue—Sets the QoS group ID (1 to 99) and evaluates the next rate-limit command. • set-qos-transmit—Sets the QoS group ID (1 to 99) and sends the packet. • transmit—Sends the packet.
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Defaults

CAR and DCAR are disabled on the interface.

Command Modes

Interface configuration

Command History

Release	Modification
11.1 CC	This command was introduced.
12.1(5)T	The conform and exceed actions were added for the MPLS experimental field.

Usage Guidelines

Use this command to configure your CAR policy on an interface. To specify multiple policies, enter this command once for each policy.

Distributed CAR is supported only on Cisco 7000 series routers with an RSP7000 or Cisco 7500 series routers with VIP2-40 or greater interface processor. A VIP2-50 interface processor is strongly recommended when the aggregate line rate of the port adapters on the VIP is greater than DS3. A VIP2-50 interface processor is required for OC-3 rates.

CAR and DCAR can only be used with IP traffic. Non-IP traffic is not rate limited.

CAR and DCAR can be configured on an interface or subinterface. However, CAR and DCAR are not supported on the Fast EtherChannel, tunnel, or PRI interfaces, nor on any interface that does not support Cisco Express Forwarding (CEF).

CEF must be enabled on the interface before you configure CAR or DCAR.

Policing Traffic with CAR

CAR embodies a rate-limiting feature for policing traffic. When policing traffic with CAR, Cisco recommends the following values for the normal and extended burst parameters:

```
normal burst = configured rate * (1 byte)/(8 bits) * 1.5 seconds
extended burst = 2 * normal burst
```

With the listed choices for parameters, extensive test results have shown CAR to achieve the configured rate. If the burst values are too low, then the achieved rate is often much lower than the configured rate.

For more information about using CAR to police traffic, see the “Policing with CAR” section of the “Policing and Shaping Overview” in the *Cisco IOS Quality of Service Configuration Guide*, Release 12.2.

Examples

In the following example, the rate is limited by application:

- All World Wide Web traffic is sent. However, the MPLS experimental field for web traffic that conforms to the first rate policy is set to 5. For nonconforming traffic, the IP precedence is set to 0 (best effort). See the following commands in the example:

```
rate-limit input rate-limit access-group 101 20000000 3750000 7500000 conform-action
set-mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 0
access-list 101 permit tcp any any eq www
```

- FTP traffic is sent with an MPLS experimental field of 5 if it conforms to the second rate policy. If the FTP traffic exceeds the rate policy, it is dropped. See the following commands in the example:

```
rate-limit input access-group 102 10000000 1875000 3750000
conform-action set-mpls-exp-transmit 5 exceed-action drop
access-list 102 permit tcp any any eq ftp
```

- Any remaining traffic is limited to 8 Mbps, with a normal burst size of 1,500,000 bytes and an excess burst size of 3,000,000 bytes. Traffic that conforms is sent with an MPLS experimental field of 5. Traffic that does not conform is dropped. See the following command in the example:

```
rate-limit input 8000000 1500000 3000000 conform-action set-mpls-exp-transmit 5
exceed-action drop
```

Notice that two access lists are created to classify the web and FTP traffic so that they can be handled separately by the CAR feature:

```
interface Hssi0/0/0
description 45Mbps to R2
rate-limit input rate-limit access-group 101 20000000 3750000 7500000
conform-action set-mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 0
rate-limit input access-group 102 10000000 1875000 3750000
conform-action set-mpls-exp-transmit 5 exceed-action drop
rate-limit input 8000000 1500000 3000000 conform-action
set-mpls-exp-transmit 5 exceed-action drop
ip address 200.200.14.250 255.255.255.252
!
access-list 101 permit tcp any any eq www
access-list 102 permit tcp any any eq ftp
```

In the following example, the MPLS experimental field is set and the packet is sent:

```
interface FastEthernet1/1/0
rate-limit input 8000 1500 3000 access-group conform-action
set mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 5
```

In the following example, any packet with a DSCP of 1 can apply the rate limit:

```
interface pos6/1/0
rate-limit output dscp 1 8000 1500 3000 conform-action transmit exceed-action drop
```

Related Commands

Command	Description
access-list rate-limit	Configures an access list for use with CAR policies.
show access-lists rate-limit	Displays information about rate-limit access lists.
show interfaces rate-limit	Displays information about CAR for an interface.
show ip rsvp installed	Displays RSVP-related installed filters and corresponding bandwidth information.

send qdm message

To send a text message to all Quality Device Manager (QDM) clients, use the **send qdm message** EXEC command.

send qdm [**client** *client-id*] **message** *message-text*

Syntax Description

client	(Optional) Specifies a QDM client to receive the message.
<i>client-id</i>	(Optional) Specifies the QDM identification of the client that will receive the text message.
message	Specifies that a message will be sent.
<i>message-text</i>	The actual text of the message.

Defaults

This command has no default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
Release 12.1(1)E	This command was introduced.
Release 12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

Usage Guidelines

Use the **send qdm** [**client** *client-id*] **message** *message-text* command to send a message to a specific QDM client. For example, entering the **send qdm client 9 message hello** command will send the message “hello” to client ID 9.

Use the **send qdm message** *message-text* command to send a message to all QDM clients. For example, entering the **send qdm message hello** command sends the message “hello” to all open QDM clients.

Examples

The following example sends the text message “how are you?” to client ID 12:

```
send qdm client 12 message how are you?
```

The following example sends the text message “how is everybody?” to all QDM clients connected to the router:

```
send qdm message how is everybody?
```

Related Commands

Command	Description
show qdm status	Displays the status of connected QDM clients.

service-policy

To attach a policy map to an input interface or virtual circuit (VC), or an output interface or VC, to be used as the service policy for that interface or VC, use the **service-policy** interface configuration command. To remove a service policy from an input or output interface or input or output VC, use the **no** form of this command.

service-policy {**input** | **output**} *policy-map-name*

no service-policy {**input** | **output**} *policy-map-name*

Syntax Description

input	Attaches the specified policy map to the input interface or input VC.
output	Attaches the specified policy map to the output interface or output VC.
<i>policy-map-name</i>	The name of a service policy map (created using the policy-map command) to be attached.

Defaults

No service policy is specified.

Command Modes

Interface configuration

VC submode (for a standalone VC)

Bundle-vc configuration (for ATM VC bundle members)

Map-class configuration (for Frame Relay VCs)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T. This command was modified to enable low latency queueing (LLQ) on Frame Relay VCs.

Usage Guidelines

You can attach a single policy map to one or more interfaces or one or more VCs to specify the service policy for those interfaces or VCs.

Currently a service policy specifies class-based weighted fair queueing (CBWFQ). The class policies comprising the policy map are then applied to packets that satisfy the class map match criteria for the class.

To successfully attach a policy map to an interface or a VC, the aggregate of the configured minimum bandwidths of the classes comprising the policy map must be less than or equal to 75 percent of the interface bandwidth or the bandwidth allocated to the VC.

To enable LLQ for Frame Relay (priority queueing (PQ)/CBWFQ), you must first enable Frame Relay Traffic Shaping (FRTS) on the interface using the **frame-relay traffic-shaping** command in interface configuration mode. You will then attach an output service policy to the Frame Relay VC using the **service-policy** command in map-class configuration mode.

For a policy map to be successfully attached to an interface or ATM VC, the aggregate of the configured minimum bandwidths of the classes that make up the policy map must be less than or equal to 75 percent of the interface bandwidth or the bandwidth allocated to the VC. For a Frame Relay VC, the total amount of bandwidth allocated must not exceed the minimum committed information rate (CIR) configured for the VC less any bandwidth reserved by the **frame-relay voice bandwidth** or **frame-relay ip rtp priority** map-class commands. If not configured, the minimum CIR defaults to half of the CIR.

Configuring CBWFQ on a physical interface is only possible if the interface is in the default queueing mode. Serial interfaces at E1 (2.048 Mbps) and below use WFQ by default. Other interfaces use FIFO by default. Enabling CBWFQ on a physical interface overrides the default interface queueing method. Enabling CBWFQ on an ATM permanent virtual circuit (PVC) does not override the default queueing method.

Attaching a service policy and enabling CBWFQ on an interface renders ineffective any commands related to fancy queueing such as commands pertaining to fair queueing, custom queueing, priority queueing, and Weighted Random Early Detection (WRED). You can configure these features only after you remove the policy map from the interface.

You can modify a policy map attached to an interface or a VC, changing the bandwidth of any of the classes comprising the map. Bandwidth changes that you make to an attached policy map are effective only if the aggregate of the bandwidth amounts for all classes comprising the policy map, including the modified class bandwidth, less than or equal to 75 percent of the interface bandwidth or the VC bandwidth. If the new aggregate bandwidth amount exceeds 75 percent of the interface bandwidth or VC bandwidth, the policy map is not modified.

Examples

The following example shows how to attach the service policy map called policy9 to data-link connection identifier (DLCI) 100 on output serial interface 1 and enables LLQ for Frame Relay:

```
interface Serial1/0.1 point-to-point
  frame-relay interface-dlci 100
    class fragment
  !
map-class frame-relay fragment
  service-policy output policy9
```

The following example attaches the service policy map called policy9 to input serial interface 1:

```
interface Serial1
  service-policy input policy9
```

The following example attaches the service policy map called policy9 to the input PVC called cisco:

```
pvc cisco 0/34
  service-policy input policy9
vbr-nt 5000 3000 500
precedence 4-7
```

The following example attaches the policy called policy9 to output serial interface 1 to specify the service policy for the interface and enable CBWFQ on it:

```
interface serial1
  service-policy output policy9
```

The following example attaches the service policy map called policy9 to the output PVC called cisco:

```
pvc cisco 0/5
  service-policy output policy9
vbr-nt 4000 2000 500
precedence 2-3
```

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show frame-relay pvc	Displays statistics about PVCs for Frame Relay interfaces.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
show policy-map interface	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

service-policy (class-map)

To attach a policy map to a class, use the **service-policy** class-map configuration command. To remove a service policy from a class, use the **no** form of this command.

service-policy *policy-map*

no service-policy

Syntax Description	<i>policy-map</i>	The name of a service policy map (created using the policy-map command) to be attached.
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Defaults	No service policy is specified.
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Command Modes	Class-map configuration
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Command History	Release	Modification
	12.1(2)T	This command was introduced.

Usage Guidelines	You can attach a single policy map to one or more classes to specify the service policy for those classes. This command is only available for the output interface, which is assumed.
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Examples	In the following example, three policy maps are defined—cust1-classes, cust2-classes, and cust-policy. The policy maps cust1-classes and cust2-classes have three classes defined—gold, silver, and bronze.
	For cust1-classes, gold is configured to use 50 percent of the bandwidth. Silver is configured to use 20 percent of the bandwidth, and bronze is configured to use 15 percent of the bandwidth.
	For cust2-classes, gold is configured to use 30 percent of the bandwidth. Silver is configured to use 15 percent of the bandwidth, and bronze is configured to use 10 percent of the bandwidth.
	The policy map cust-policy specifies average rate shaping of 384 kbps and assigns the service policy called cust1-classes to the policy map called cust1-classes. The policy map called cust-policy specifies peak rate shaping of 512 kbps and assigns the service policy called cust2-classes to the policy map called cust2-classes.

To configure classes for cust1-classes, use the following commands:

```
Router(config)# policy-map cust1-classes
Router(config-pmap)# class gold
Router(config-pmap-c)# bandwidth percent 50
Router(config-pmap)# class silver
Router(config-pmap-c)# bandwidth percent 20
Router(config-pmap)# class bronze
Router(config-pmap-c)# bandwidth percent 15
```

To configure classes for cust2, use the following commands:

```
Router(config)# policy-map cust2-classes
Router(config-pmap)# class gold
Router(config-pmap-c)# bandwidth percent 30
Router(config-pmap)# class silver
Router(config-pmap-c)# bandwidth percent 15
Router(config-pmap)# class bronze
Router(config-pmap-c)# bandwidth percent 10
```

To define the customer policy with cust1-classes and cust2-classes and QoS features, use the following commands:

```
Router(config)# policy-map cust-policy
Router(config-pmap)# class cust1
Router(config-pmap-c)# shape average 38400
Router(config-pmap-c)# service-policy cust1-classes
Router(config-pmap)# class cust2
Router(config-pmap-c)# shape peak 51200
Router(config-pmap-c)# service-policy cust2-classes
Router(config-pmap-c)# interface Serial 3/2
Router(config-if)# service out cust-policy
```

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.

service-policy (policy-map class)

To use a service policy as a QoS policy within a policy map (called a hierarchical service policy), use the **service-policy** policy-map class configuration command. To disable a particular service policy as a QoS policy within a policy map, use the **no** form of this command.

service-policy *policy-map-name*

no service-policy *policy-map-name*

Syntax Description	<i>policy-map-name</i>	Specifies the name of the predefined policy map to be used as a QoS policy.
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Defaults	This command has no default behavior or values.
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Command Modes	Policy-map class configuration
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Command History	Release	Modification
	12.1(2)E	This command was introduced.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

Usage Guidelines	This command is used to create hierarchical service policies in policy-map class configuration mode.
	This command is different from the service-policy [input output] <i>policy-map-name</i> command used in interface configuration mode. The purpose of the service-policy [input output] <i>policy-map-name</i> is to attach service policies to interfaces.

The child policy is the previously defined service policy that is being associated with the new service policy through the use of the **service-policy** command. The new service policy using the preexisting service policy is the parent policy.

This command has the following restrictions:

- The **set** command is not supported on the child policy.
- The **priority** command can be used in either the parent or the child policy, but not both policies simultaneously.
- The **shape** command cannot be used in child policies (for instance, in hierarchical shaping) on a subinterface.
- The **fair-queue** command cannot be defined in the parent policy.
- If the **bandwidth** command is used in the child policy, the **bandwidth** command must also be used in the parent policy. The one exception is for policies using the default class.

Examples

The following example creates a hierarchical service policy in the service policy called parent:

```
Router(config)# policy-map child
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 50

Router(config)# policy-map parent
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 10000000
Router(config-pmap-c)# service-policy child
```

FRF.11 and FRF.12 configurations on a Versatile Interface Processor (VIP)-enabled Cisco 7500 series router often require a hierarchical service policy for configuration. A hierarchical service policy for FRF.11 and FRF.12 requires the following elements:

1. A traffic class that uses the Voice over Frame Relay (VoFR) protocol as the only match criterion.
2. A traffic policy that insures low latency queueing (LLQ), which is achieved using the **priority** command, for all VoFR protocol traffic
3. A traffic policy that defines the shaping parameters and includes the elements listed in element 2.

Element 3 can only be fulfilled through the use of a hierarchical service policy, which is configured using the **service-policy** command.

In the following example, element 1 is configured in the traffic class called frf, element 2 is configured in the traffic policy called llq, and element 3 is configured in the traffic policy called llq-shape.

```
Router(config)# class-map frf
Router(config-cmap)# match protocol vofr
Router(config-cmap)# exit
Router(config)# policy-map llq
Router(config-pmap)# class frf
Router(config-pmap-c)# priority 2000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# policy-map llq-shape
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 1000 128000
Router(config-pmap-c)# service-policy llq
```

The final step in using a hierarchical service policy for FRF.11 and FRF.12 is using the service policy in map-class configuration mode. In the following example, the traffic policy called llq-shape is attached to the map class called frag:

```
Router(config)# map-class frame-relay frag
Router(config-map-class)# frame-relay fragment 40
Router(config-map-class)# service-policy llq-shape
```

Related Commands

Command	Description
bandwidth (policy-map class)	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
fair-queue	Specifies the number of queues to be reserved for use by a traffic class.
policy-map	Specifies the name of the service policy to configure.
priority	Gives priority to a class of traffic belonging to a policy map.
service-policy	Specifies the name of the service policy to be attached to the interface.
shape	Specifies average or peak rate traffic shaping.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
show policy-map interface	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

set atm-clp

To set the cell loss priority (CLP) bit setting when configuring a policy map, use the **set atm-clp** policy-map class configuration command.

set atm-clp

Syntax Description

This command has no arguments or keywords.

Defaults

The CLP bit is automatically set to 0 when Cisco routers convert IP packets into ATM cells for transmission through Multiprotocol Label Switching (MPLS)-aware ATM networks.

Command Modes

Policy-map class

Command History

Release	Modification
12.0(7)S	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

Usage Guidelines

To disable this command, remove the service policy from the interface.

To use the **set atm-clp** command, you must have one of the following adapters: the Enhanced ATM Port Adapter (PA-A3), the ATM Inverse Multiplexer over ATM Port Adapter with 8 T1 Ports (PA-A3-8T1IMA), or the ATM Inverse Multiplexer over ATM Port Adapter with 8 E1 Ports (PA-A3-8E1IMA). Therefore, the **set atm-clp** command is not supported on any platform that does not support these adapters. For more information, refer to the documentation for your specific router.

A policy map containing the **set atm-clp** command can be attached as an output policy only. The **set atm-clp** command does not support packets that originate from the router.

Examples

The following example illustrates a CLP bit set using the **set atm-clp** command in the policy map:

```
Router(config)# class-map ip-prec
Router(config-cmap)# match ip precedence 0 1
Router(config-cmap)# exit
Router(config)# policy-map atm-clp-set
Router(config-pmap)# class ip-prec
Router(config-pmap-c)# set atm-clp
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0
Router(config)# service-policy output bear
```

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show atm pvc	Displays information about the PVCs on an interface.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.

set cos

To set the Layer 2 class of service (CoS) value of an outgoing packet, use the **set cos** policy-map class configuration command. To remove a specific CoS value setting, use the **no** form of this command:

set cos *cos-value*

no set cos *cos-value*

Syntax Description	<i>cos-value</i>	Specific IEEE 802.1Q CoS value from 0 to 7.
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Defaults	Disabled
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Command Modes	Policy-map class configuration
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Command History	Release	Modification
	12.1(5)T	This command was introduced.

Usage Guidelines	CoS packet marking is only supported in the Cisco Express Forwarding (CEF)-switching path. The set cos command should be used by a router if a user wants to mark a packet that is being sent to a switch. Switches can leverage Layer 2 header information, including a CoS value marking. The set cos command can be used only in service policies that are attached in the output direction of an interface. Packets entering an interface cannot be set with a CoS value. The match cos and set cos commands can be used together to allow routers and switches to interoperate and provide QoS based on the CoS markings. Layer 2 to Layer 3 mapping can be configured by matching on the CoS value because switches already can match and set CoS values. If a packet that needs to be marked to differentiate user-defined QoS services is leaving a router and entering a switch, the router should set the CoS value of the packet because the switch can process the Layer 2 header.
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Examples

In the following example, the policy map called cos-set is created to assign different CoSs for different types of traffic. This example assumes that the class maps called voice and video-data have already been created.

```
Router(config)# policy-map cos-set
Router(config-pmap)# class voice
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# exit
Router(config-pmap)# class video-data
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

This command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, refer to the “Modular Quality of Service Command-Line Interface” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
show policy-map class	Displays the configuration for the specified class of the specified policy map.
show policy-map interface	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

set ip dscp

To mark a packet by setting the IP differentiated services code point (DSCP) in the type of service (ToS) byte, use the **set ip dscp** QoS policy-map configuration command. To remove a previously set IP DSCP, use the **no** form of this command.

set ip dscp *ip-dscp-value*

no set ip dscp *ip-dscp-value*

Syntax Description

<i>ip-dscp-value</i>	A number from 0 to 63 that sets the IP DSCP value. Reserved keywords EF (expedited forwarding), AF11 (assured forwarding class AF11), and AF12 (assured forwarding class AF12) can be specified instead of numeric values.
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Defaults

This command has no default behavior or values.

Command Modes

QoS policy-map configuration

Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T. This command was enhanced to include reserved keywords EF , AF11 , and AF12 instead of numeric values.

Usage Guidelines

Once the IP DSCP bit is set, other QoS services can then operate on the bit settings.

You cannot mark a packet by the IP precedence with the **set ip precedence** command and mark the same packet with an IP DSCP value by entering the **set ip dscp** command.

The network gives priority (or some type of expedited handling) to marked traffic. Typically, you set IP precedence at the edge of the network (or administrative domain); data then is queued based on the precedence. Weighted fair queueing (WFQ) can speed up handling for high-precedence traffic at congestion points. Weighted Random Early Detection (WRED) ensures that high-precedence traffic has lower loss rates than other traffic during times of congestion.

Reserved keywords **EF**, **AF11**, and **AF12** can be specified instead of numeric values.

Examples

In the following example, the IP DSCP ToS byte is set to 8 in the policy map called policy1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip dscp 8
```

All packets that satisfy the match criteria of class1 are marked with the IP DSCP value of 8. How packets marked with the IP DSCP value of 8 are treated is determined by the network configuration.

After you configure the settings shown for voice packets at the edge, all intermediate routers are then configured to provide low latency treatment to the voice packets, as follows:

```
Router(config)# class-map voice
Router(config-cmap)# match ip dscp ef
Router(config)# policy qos-policy
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 24
```

The **set ip dscp** command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, refer to the “Modular Quality of Service Command-Line Interface” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
show policy-map class	Displays the configuration for the specified class of the specified policy map.
show policy-map interface	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

set ip precedence (policy-map)

To set the precedence value in the IP header, use the **set ip precedence** QoS policy-map configuration command. To leave the precedence value at the current setting, use the **no** form of this command.

set ip precedence *ip-precedence-value*

no set ip precedence

Syntax Description

ip-precedence-value A number from 0 to 7 that sets the precedence bit in the IP header.

Defaults

This command is disabled by default.

Command Modes

QoS policy-map configuration

Command History

Release	Modification
11.0	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE. This command was introduced in the Modular Quality of Service Command-Line Interface (MQC) feature.

Usage Guidelines

Once the IP precedence bits are set, other QoS services such as weighted fair queueing (WFQ) and Weighted Random Early Detection (WRED) then operate on the bit settings.

The network gives priority (or some type of expedited handling) to marked traffic through the application of WFQ or WRED at points downstream in the network. Typically, you set IP Precedence at the edge of the network (or administrative domain); data then is queued based on the precedence. WFQ can speed up handling for certain precedence traffic at congestion points. WRED can ensure that certain precedence traffic has lower loss rates than other traffic during times of congestion.

Examples

The following example sets the IP Precedence to 5 for packets that satisfy the match criteria of the class map called class1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip precedence 5
```

All packets that satisfy the match criteria of class1 are marked with the IP Precedence value of 5. How packets marked with the IP Precedence value of 5 are treated is determined by the network configuration.

The **set ip precedence** command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not yet attached to an interface or to an ATM virtual circuit. For information on attaching a service policy to an interface, refer to the “Modular Quality of Service Command-Line Interface” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Related Commands	Command	Description
	policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	service-policy	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
	show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	show policy-map interface	Displays the configuration for all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

set ip precedence (route-map)

To set the precedence value (and an optional IP number or IP name) in the IP header, use the **set ip precedence** route-map configuration command. To leave the precedence value unchanged, use the **no** form of this command.

set ip precedence [*number* | *name*]

no set ip precedence

Syntax Description

<i>number</i> <i>name</i>	(Optional) A number or name that sets the precedence bits in the IP header. The values for the <i>number</i> argument and the corresponding <i>name</i> argument are listed in Table 16, from least to most important.
-----------------------------	--

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

[Table 16](#) lists the values for the *number* argument and the corresponding *name* argument for precedence values in the IP header. They are listed from least to most important.

Table 16 Number and Name Values for IP Precedence

Number	Name
0	routine
1	priority
2	immediate
3	flash
4	flash-override
5	critical
6	internet
7	network

You can set the precedence using either a number or the corresponding name. Once the IP Precedence bits are set, other QoS services such as weighted fair queueing (WFQ) and Weighted Random Early Detection (WRED) then operate on the bit settings.

The network gives priority (or some type of expedited handling) to marked traffic through the application of WFQ or WRED at points downstream in the network. Typically, you set IP Precedence at the edge of the network (or administrative domain); data then is queued based on the precedence. WFQ can speed up handling for certain precedence traffic at congestion points. WRED can ensure that certain precedence traffic has lower loss rates than other traffic during times of congestion.

The mapping from arguments such as **routine** and **priority** to a precedence value is useful only in some instances. That is, the use of the precedence bit is evolving. You can define the meaning of a precedence value by enabling other features that use the value. In the case of the high-end Internet QoS available from Cisco, IP Precedences can be used to establish classes of service that do not necessarily correspond numerically to better or worse handling in the network.

Use the **route-map** (IP) global configuration command with the **match** and **set** route-map configuration commands to define the conditions for redistributing routes from one routing protocol into another, or for policy routing. Each **route-map** command has an associated list of **match** and **set** commands. The **match** commands specify the match criteria—the conditions under which redistribution or policy routing is allowed for the current **route-map** command. The **set** commands specify the set actions—the particular redistribution or policy routing actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution set actions to be performed when all of the match criteria of a route map are met.

Examples

The following example sets the IP Precedence to 5 (critical) for packets that pass the route map match:

```
interface serial 0
 ip policy route-map texas

route-map texas
match length 68 128
set ip precedence 5
```

Related Commands

Command	Description
fair-queue (WFQ)	Enables WFQ for an interface.
ip policy route-map	Identifies a route map to use for policy routing on an interface.
random-detect dscp	Changes the minimum and maximum packet thresholds for the DSCP value.
rate-limit	Configures CAR and DCAR policies.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
traffic-shape adaptive	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
traffic-shape fecn-adapt	Replies to messages with the FECN bit (which are set with TEST RESPONSE messages with the BECN bit set).
traffic-shape group	Enables traffic shaping based on a specific access list for outbound traffic on an interface.
traffic-shape rate	Enables traffic shaping for outbound traffic on an interface.

set ip qos-group

To set a group ID that can be used later to classify packets, use the **set ip qos-group** route-map configuration command. To remove the group ID, use the **no** form of this command.

set ip qos-group *group-id*

no set ip qos-group *group-id*

Syntax Description

<i>group-id</i>	Group ID number in the range from 0 to 99.
-----------------	--

Defaults

This command is disabled by default. No group ID is specified.

Command Modes

Route-map configuration

Command History

Release	Modification
11.1 CC	This command was introduced.

Usage Guidelines

This command allows you to set a group ID in the routing table that can be used later to classify packets into QoS groups based on prefix, autonomous system, and community string. These packets can then be rate limited or weighted fairly in the queue based on the QoS group ID.

To display QoS group information, use the **show ip cef** command.

Examples

The following example sets the QoS group to 1 for all packets that match community 1. These packets are then rate limited based on the QoS group ID.

```
configure terminal
route-map precedence-map permit 10
match community 1
set ip qos-group 1
interface hssi0/0/0
  bgp-policy source qos-group
end
```

set ip tos (route-map)

To set the type of service (TOS) bits in the header of an IP packet, use the **set ip tos** command in route-map configuration mode. To leave the TOS bits unchanged, use the **no** form of this command.

set ip tos [*number*]

no set ip tos

Syntax Description

number (Optional) A number from 0 to 15 that sets the TOS bits in the IP header. See [Table 17](#) for more information.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

This command allows you to set four bits in the TOS byte header. [Table 17](#) shows the format of the four bits in binary form.

Table 17 TOS Bits and Description

T3	T2	T1	T0	Description
0	0	0	0	0 normal forwarding
0	0	0	1	1 minimum monetary cost
0	0	1	0	2 maximum reliability
0	1	0	0	4 maximum throughput
1	0	0	0	8 minimum delay

The T3 bit sets the delay. Setting T3 to 0 equals normal delay, and setting it to 1 equals low delay.

The T2 bit sets the throughput. Setting this bit to 0 equals normal throughput, and setting it to 1 equals maximum throughput. Similarly, the T1 and T0 bits set reliability and cost, respectively. Therefore, as an example, if you want to set a packet with the following requirements:

minimum delay T3 = 1
 normal throughput T2= 0
 normal reliability T1=0
 minimum monetary cost T0=1

You would set the TOS to 9, which is 1001 in binary format.

Use the **route-map** (IP) global configuration command with the **match** and **set** route-map configuration commands to define the conditions for redistributing routes from one routing protocol into another, or for policy routing. Each **route-map** command has an associated list of **match** and **set** commands. The **match** commands specify the match criteria—the conditions under which redistribution or policy routing is allowed for the current route-map command. The **set** commands specify the set actions—the particular redistribution or policy routing actions to perform if the criteria enforced by the match commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution set actions to be performed when all of the match criteria of a route map are met.

Examples

The following example sets the IP TOS bits to 8 (minimum delay as shown in [Table 17](#)) for packets that pass the route-map match:

```
interface serial 0
 ip policy route-map texas
!
route-map texas
 match length 68 128
 set ip tos 8
!
```

Related Commands

Command	Description
ip policy route-map	Identifies a route map to use for policy routing on an interface.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.

set qos-group

To set a group ID that can be used later to classify packets, use the **set qos-group** QoS policy-map configuration command. To remove the group ID, use the **no** form of this command.

set qos-group *group-id*

no set qos-group *group-id*

Syntax Description

<i>group-id</i>	Group ID number in the range from 0 to 99.
-----------------	--

Defaults

This command is disabled by default. No group ID is specified.

Command Modes

QoS policy-map configuration

Command History

Release	Modification
11.1 CC	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE. This command was included in the Modular Quality of Service Command-Line Interface (MQC) feature.

Usage Guidelines

This command allows you to associate a group ID with a packet. The group ID can be used later to classify packets into QoS groups based on prefix, autonomous system, and community string.

To display QoS group information, use the **show ip cef** command.

Examples

The following example sets the QoS group to 1 for all packets that match the class map called class1. These packets are then rate limited based on the QoS group ID.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set qos-group 1
```

The **set qos-group** command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not yet attached to an interface or an ATM virtual circuit. For information on attaching a service policy to an interface, refer to the “Modular Quality of Service Command-Line Interface” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Related Commands	Command	Description
	policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	service-policy	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
	show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	show policy-map interface	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.