QoS: Policing and Shaping Configuration Guide, Cisco IOS XE Gibraltar 16.10.x (Cisco NCS 520 Series)

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CHAPTER 1

Class-Based Policing

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- Prerequisites, on page 2
- Configuration Tasks, on page 3
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Finding Feature Information

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

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

Feature Overview

Class-Based Policing allows you to control the maximum rate of traffic transmitted or received on an interface. The Class-Based Policing feature is applied when you attach a traffic policy contain the Class-Based Policing configuration to an interface.

The Class-Based Policing feature performs the following functions:

- Limits the input transmission rate of a class of traffic based on user-defined criteria
- Marks packets by setting COS, QoS group, and DSCP.

Benefits

Bandwidth Management Through Rate Limiting

Class-Based Policing allows you to control the maximum rate of traffic transmitted or received on an interface. Class-Based Policing is often configured on interfaces at the edge of a network to limit traffic into or out of the network. In most Class-Based Policing configurations, traffic that falls within the rate parameters is transmitted, whereas traffic that exceeds the parameters is dropped or transmitted with a different priority.

Packet Marking

Packet marking allows you to partition your network into multiple priority levels or classes of service (CoS). A packet is marked and these markings can be used to identify and classify traffic for downstream devices.

- Use Class-Based Policing to set the IP precedence for packets entering the network. Networking devices within your network can then use the adjusted IP precedence values to determine how the traffic should be treated.
- Use Class-Based Policing to assign packets to a QoS group. The router uses the QoS group to determine how to prioritize packets within the router.

Traffic can be marked without using the Class-Based Policing feature. If you want to mark traffic but do not want to use Class-Based Policing, see the "Marking Network Traffic" module.

Restrictions

- On a Cisco NCS 520 router, Class-Based Policing can monitor Cisco Express Forwarding (CEF) switching paths only. In order to use the Class-Based Policing feature, Cisco Express Forwarding must be configured on both the interface receiving the packet and the interface sending the packet.
- On a Cisco NCS 520 router, Class-Based Policing cannot be applied to packets that originated from or are destined to a device.
- Class-Based Policing can be configured on an interface or a subinterface.
- Class-Based Policing can be applied on physical interface or service instance.

Prerequisites

On a Cisco NCS 520 router, Cisco Express Forwarding (CEF) must be configured on the interface before Class-Based Policing can be used.

Configuration Tasks

Configuring Traffic Policing

Command	Purpose
Device(config-pmap-c)# **police** *bps burst-normal burst-max* **conform-action** *action* **exceed-action** *action* **violate-action** *action*	Specifies a maximum bandwidth usage by a traffic class. **Note** The Class-Based Policing feature works with a token bucket mechanism. There are currently two types of token bucket algorithms: a single token bucket algorithm and a two token bucket algorithm. A single token bucket system is used when the **violate-action** option is not specified, and a two token bucket system is used when the **violate-action** option is specified.

Verifying Traffic Policing

Use the **show policy-map interface** EXEC command to verify that the Class-Based Policing feature is configured on your interface. If the feature is configured on your interface, the **show policy-map interface** command output displays policing statistics:

```
Device# show policy-map interface
 Ethernet1/7
  service-policy output: x
    class-map: a (match-all)
      0 packets, 0 bytes
      5 minute rate 0 bps
      match: ip precedence 0
      police:
        1000000 bps, 10000 limit, 10000 extended limit
        conformed 0 packets, 0 bytes; action: transmit
        exceeded 0 packets, 0 bytes; action: drop
        conformed 0 bps, exceed 0 bps, violate 0 bps
```

Troubleshooting Tips

- Check the interface type. Verify that your interface is not mentioned in the nonsupported interface description in the Restrictions, on page 2 section of this module.
- For input Class-Based Policing on a Cisco NCS 520 Series router, verify that CEF is configured on the interface where Class-Based Policing is configured.
- For output Class-Based Policing on a Cisco NCS 520 Series router, ensure that the incoming traffic is CEF-switched. Class-Based Policing cannot be used on the switching path unless CEF switching is enabled.

Monitoring and Maintaining Traffic Policing

Command	Purpose
Device# **show policy-map**	Displays all configured policy maps.
Device# **show policy-map** *policy-map-name*	Displays the user-specified policy map.
Device# **show policy-map interface**	Displays statistics and configurations of all input and output policies that are attached to an interface.
Device# **show policy-map interface service instance**	Displays the policy map information for a given service instance under a port channel.

Configuration Examples

Example Configuring a Service Policy that Includes Traffic Policing

In the following example, Class-Based Policing is configured with the average rate at 8000 bits per second, the normal burst size at 1000 bytes, and the excess burst size at 1000 bytes for all packets leaving Fast Ethernet interface 0/0.

```
class-map access-match
match access-group 1
exit
policy-map police-setting
class access-match
police 8000 1000 1000 conform-action transmit exceed-action set-qos-transmit 1 violate-action
 drop
exit
exit
service-policy input police-setting
```

The treatment of a series of packets leaving Fast Ethernet interface 0/0 depends on the size of the packet and the number of bytes remaining in the conform and exceed token buckets. The series of packets are policed based on the following rules:

- If the previous arrival of the packet was at T1 and the current arrival of the packet is at T, the bucket is updated with T -T1 worth of bits based on the token arrival rate. The refill tokens are placed in the conform bucket. If the tokens overflow the conform bucket, the overflow tokens are placed in the exceed bucket. The token arrival rate is calculated as follows:

(time between packets <which is equal to T - T1> * policer rate)/8 bytes

- If the number of bytes in the conform bucket B is greater than or equal to 0, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is taken. The exceed bucket is unaffected in this scenario.
- If the number of bytes in the conform bucket B is less than 0, the excess token bucket is checked for bytes by the packet. If the number of bytes in the exceed bucket B is greater than or equal to 0, the exceed

action is taken and B bytes are removed from the exceed token bucket. No bytes are removed from the conform bucket in this scenario.

- If the number bytes in the exceed bucket B is fewer than 0, the packet violates the rate and the violate action is taken. The action is complete for the packet.

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the conform token bucket

((0.25 * 8000)/8), leaving 800 bytes in the conform token bucket. If the next packet is 900 bytes, the packet does not conform because only 800 bytes are available in the conform token bucket.

The exceed token bucket, which starts full at 1000 bytes (as specified by the excess burst size) is then checked for available bytes. Because enough bytes are available in the exceed token bucket, the exceed action (set the QoS transmit value of 1) is taken and 900 bytes are taken from the exceed bucket (leaving 100 bytes in the exceed token bucket.

If the next packet arrives 0.40 seconds later, 400 bytes are added to the token buckets ((.40 * 8000)/8). Therefore, the conform token bucket now has 1000 bytes (the maximum number of tokens available in the conform bucket) and 200 bytes overflow the conform token bucket (because it only 200 bytes were needed to fill the conform token bucket to capacity). These overflow bytes are placed in the exceed token bucket, giving the exceed token bucket 300 bytes.

If the arriving packet is 1000 bytes, the packet conforms because enough bytes are available in the conform token bucket. The conform action (transmit) is taken by the packet, and 1000 bytes are removed from the conform token bucket (leaving 0 bytes).

If the next packet arrives 0.20 seconds later, 200 bytes are added to the token bucket ((.20 * 8000)/8). Therefore, the conform bucket now has 200 bytes. If the arriving packet is 400 bytes, the packet does not conform because only 200 bytes are available in the conform bucket. Similarly, the packet does not exceed because only 300 bytes are available in the exceed bucket. Therefore, the packet violates and the violate action (drop) is taken.

Additional References

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*
Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC), hierarchical policies, policy maps	"Applying QoS Features Using the MQC" module
Policing and shaping traffic	"Policing and Shaping Overview" 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 XE software 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
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

CHAPTER 2

Port-Shaper and LLQ in the Presence of EFPs

The Port-Shaper and LLQ in the Presence of EFPs feature allows network designers to configure port and class policies on ports that contain Ethernet Flow Points (EFPs). These policies support Low Latency Queueing (LLQ) and traffic prioritization across the EFPs.

- Finding Feature Information, on page 7
- Restrictions for Port-Shaper and LLQ in the Presence of EFPs, on page 7
- Information About Port-Shaper and LLQ in the Presence of EFPs, on page 8
- How to Configure Port-Shaper and LLQ in the Presence of EFPs, on page 8
- Additional References, on page 15

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Restrictions for Port-Shaper and LLQ in the Presence of EFPs

- For port-shaper in the presence of EFPs, policy on the port must be applied first followed by policy on EFP. Applying policy on EFP first followed by the port does not work.
- If you configure a class-based policy on the port, then you cannot configure service-policies on Ethernet Flow Points (EFPs).
- Attaching a service policy to the BDI is not supported.
- Usage of bandwidth remaining percentage (BRP) in the absence of priority class, allocates the available bandwidth in an iterative way. For example, the bandwidth is allocated for the first BRP class as per the percentage of share configured in the respective class-map and the remaining bandwidth is iteratively allocated to all other BRP classes until the bandwidth is exhausted.
- When the port is down, if you manually change the port speed then it may result in unexpected behavior.

- You must remove bandwidth statement from the child policy before it is removed from the child policy.

Information About Port-Shaper and LLQ in the Presence of EFPs

Ethernet Flow Points and LLQ

An Ethernet Flow Point (EFP) is a forwarding decision point in the provider edge (PE) router, which gives network designers flexibility to make many Layer 2 flow decisions within the interface. Many EFPs can be configured on a single physical port. (The number varies from one device to another.) EFPs are the logical demarcation points of an Ethernet virtual connection (EVC) on an interface. An EVC that uses two or more User-Network Interfaces (UNIs) requires an EFP on the associated ingress and egress interfaces of every device that the EVC passes through.

The Egress HQoS with Port Level Shaping feature allows network designers to configure port and class policies on ports that contain EFPs. These policies support Low Latency Queueing (LLQ) and traffic prioritization across the EFPs.

For information on how to configure LLQ, see the *QoS Congestion Management Configuration Guide*.

How to Configure Port-Shaper and LLQ in the Presence of EFPs

To configure the Port-Shaper and LLQ in the Presence of EFPs feature, you first create either a hierarchical or flat policy map that supports Low Latency Queueing (LLQ), which you then attach to an EFP interface.

Configuring Hierarchical Policy Maps

To configure hierarchical policy maps, you create child policies which you then attach to a parent policy. The parent policy is then attached to an interface.

Procedure

Step 1 **enable**

Example:

```
Device> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 2 **configure terminal**

Example:

```
Device# configure terminal
```

Enters global configuration mode.

Step 3 **policy-map** *policy-map-name*

Example:

```
Device(config)# policy-map child-llq
```

Creates or modifies the child policy and enters QoS policy-map configuration mode.

- child-llq is the name of the child policy map.

Step 4 **class** *class-map-name*

Example:

```
Device(config-pmap)# class qos-1
```

Assigns the traffic class you specify to the policy map and enters QoS policy-map class configuration mode.

- qos-1 is the name of a previously configured class map and is the traffic class for which you want to define QoS actions.

Step 5 **bandwidth percent** *percent*

Example:

```
Device(config-pmap-c)# bandwidth percent 20
```

(Optional) Specifies a bandwidth percent for class-level queues to be used during congestion to determine the amount of excess bandwidth (unused by priority traffic) to allocate to nonpriority queues.

Step 6 **exit**

Example:

```
Device(config-pmap-c)# exit
```

Exits QoS policy-map class configuration mode.

Step 7 **class** *class-map-name*

Example:

```
Device(config-pmap)# class qos-2
```

Assigns the traffic class you specify to the policy map and enters QoS policy-map class configuration mode.

- qos-2 is the name of a previously configured class map and is the traffic class for which you want to define QoS actions.

Step 8 **bandwidth percent** *percent*

Example:

```
Device(config-pmap-c)# bandwidth percent 80
```

(Optional) Specifies a bandwidth percent for class-level queues to be used during congestion to determine the amount of excess bandwidth (unused by priority traffic) to allocate to nonpriority queues.

Step 9 **exit**

Example:

```
Device(config-pmap-c)# exit
```

Exits QoS policy-map class configuration mode.

Step 10 **policy-map** *policy-map-name*

Example:

```
Device(config-pmap)# policy-map parent-llq
```

Creates or modifies the parent policy.

- parent-llq is the name of the parent policy map.

Step 11 **class** *class-default*

Example:

```
Device(config-pmap)# class class-default
```

Configures or modifies the parent class-default class and enters QoS policy-map class configuration mode.

- You can configure only the class-default class in a parent policy. Do not configure any other traffic class.

Step 12 **service-policy** *policy-map-name*

Example:

```
Device(config-pmap-c)# service-policy child-llq
```

Applies the child policy to the parent class-default class.

- child-llq is the name of the child policy map configured in step 1.

Configuring an LLQ Policy Map

Procedure

Step 1 **enable**

Example:

```
Device> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 2 **configure terminal**

Example:

```
Device# configure terminal
```

Enters global configuration mode.

Step 3 **policy-map** *policy-map-name*

Example:

```
Device(config)# policy-map llq-flat
```

Creates a policy and enters QoS policy-map configuration mode.

Step 4 **class** *class-map-name*

Example:

```
Device(config-pmap)# class qos-group
```

Assigns the traffic class you specify to the policy map and enters policy-map class configuration mode.

Step 5 **priority**

Example:

```
Device(config-pmap-c)# priority
```

Configures LLQ, providing strict priority queueing (PQ) for class-based weighted fair queueing (CBWFQ).

Step 6 **exit**

Example:

```
Device(config-pmap-c)# exit
```

Exits QoS policy-map class configuration mode.

Step 7 **class** *class-map-name*

Example:

```
Device(config-pmap)# class qos-group
```

Assigns the traffic class you specify to the policy map and enters QoS policy-map class configuration mode.

Step 8 **shape average** *value*

Example:

```
Device(config-pmap-c)# shape average 200000000
```

Configures a shape entity with a Comitted Information Rate of 200 Mb/s.

Step 9 **exit**

Example:

```
Device(config-pmap-c)# exit
```

Exits QoS policy-map class configuration mode.

Step 10 **class** *class-map-name*

Example:

```
Device(config-pmap)# class qos-group
```

Assigns the traffic class you specify to the policy map and enters QoS policy-map class configuration mode.

Step 11 **bandwidth** *percent*

Example:

```
Device(config-pmap-c)# bandwidth 4000000
```

(Optional) Specifies a bandwidth percent for class-level queues to be used during congestion to determine the amount of excess bandwidth (unused by priority traffic) to allocate to non-priority queues.

Step 12 **exit**

Example:

```
Device(config-pmap-c)# exit
```

Exits QoS policy-map class configuration mode.

Configuring Port Level Shaping on the Main Interface with Ethernet Flow Points

To configure port level shaping on the main interface with EFPS, first you enable the autonegotiation protocol on the interface, then you attach a policy map to the interface and finally you configure the Ethernet service instance.

Procedure

Step 1 **enable**

Example:

```
Device> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 2 **configure terminal**

Example:

```
Device# configure terminal
```

Enters global configuration mode.

Step 3 **interface** *type number*

Example:

```
Device(config)# interface GigabitEthernet 0/0/1
```

Configures an interface type and enters interface configuration mode.

- Enter the interface type number.

Step 4 **no ip address**

Example:

```
Device(config-if)# no ip address
```

Disables IP routing on the interface.

Step 5 **negotiation auto**

Example:

```
Device(config-if)# negotiation auto
```

Enables the autonegotiation protocol to configure the speed, duplex, and automatic flow control of the Gigabit Ethernet interface.

Step 6 **service-policy output** *policy-map-name*

Example:

```
Device(config-if)# service-policy output parent-llq
```

Specifies the name of the policy map to be attached to the input or output direction of the interface.

- You can enter the name of a hierarchical or a flat policy map.

Step 7 **service instance** *id* **ethernet**

Example:

```
Device(config-if)# service instance 1 ethernet
```

Configures an Ethernet service instance on an interface and enters service instance configuration mode.

Step 8 **encapsulation dot1q** *vlan-id*

Example:

```
Device(config-if-srv)# encapsulation dot1q 100
```

Defines the matching criteria to map 802.1Q frames' ingress on an interface to the service instance.

Step 9 **bridge-domain** *bridge-domain-id*

Example:

```
Device(config-if-srv)# bridge-domain 100
```

Binds the bridge domain to the service instance.

Step 10 **exit**

Example:

```
Device(config-if-serv)# exit
```

Exits service instance configuration mode.

Step 11 **service instance** *id* **ethernet**

Example:

```
Device(config-if)# service instance 2 ethernet
```

Configures an Ethernet service instance on an interface and enters service instance configuration mode.

Step 12 **encapsulation dot1q** *vlan-id*

Example:

```
Device(config-if-srv)# encapsulation dot1q 101
```

Defines the matching criteria to map 802.1Q frames' ingress on an interface to the service instance.

Step 13 **bridge-domain** *bridge-domain-id*

Example:

```
Device(config-if-srv)# bridge-domain 101
```

Binds the bridge domain to the service instance.

Step 14 **exit**

Example:

```
Device(config-if-srv)# exit
```

Exits QoS policy-map class configuration mode.

Step 15 **end**

Example:

```
Device(config-if)# end
```

(Optional) Exits interface configuration mode.

Example: Configuring Hierarchical QoS

The router supports hierarchical QoS policies with up to three levels:

- Port policy—Uses class-default only and should be applied on physical interface as initial configuration.
- EFP policy—Uses a nested policy with parent policy matching on class-default and child policy matching on QoS-group values.

The following example displays the hierarchical QoS configuration using port policy and EFP policy:

```
policy-map parent1
class class-default
shape average 1000000000
!
policy-map EFP30
class class-default
shape average 500000000
service-policy pq_test
!
end
```

Use the **show run policy-map** to verify the configuration:

```
router#sh run policy-map pq_test
Building configuration...

Current configuration : 590 bytes
!
policy-map pq_test
class qg1
priority level 1 percent 20
queue-limit percent 10
class qg0
priority level 2 percent 10
queue-limit percent 10
class qg2
bandwidth remaining percent 15
queue-limit percent 10
class qg3
bandwidth remaining percent 20
queue-limit percent 10
class qg4
bandwidth remaining percent 25
queue-limit percent 10
class qg5
bandwidth remaining percent 10
queue-limit percent 10
class qg6
bandwidth remaining percent 25
queue-limit percent 10
class class-default
bandwidth remaining percent 5
queue-limit percent 10
!
end
```

Additional References

Related Documents

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

Related Topic	Document Title
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS QoS Command Reference*
Policing and shaping	"Policing and Shaping Overview" module
Class maps	"Applying QoS Features Using the MQC" module
Policy maps	"Applying QoS Features Using the MQC" module
Low Latency Queueing	*QoS Congestion Management Configuration Guide*

Standards and RFCs

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	--

MIBs

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

Technical Assistance

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

CHAPTER 3

Priority Shaper

Earlier, when the priority of a queue at Per-Hop Behavior (PHB) was propagated all the way up the hierarchy towards the channel level, the PHB classes that had priority at PHB level would only be prioritized over other classes of subchannels. To avoid this, Priority Shaper feature is implemented.

Priory Shaper feature helps to balance the packet drops between the streams when multiple steams egress out of a priority queue. Egress QoS policy is supported on Priority Shaper.

You can configure priority shaper in one of the following ways:

- Strict priority—You can apply one shaper per policy. Use the **priority***shaper-value* command to configure strict priority.
- Priority levels—You can apply two priority levels per policy.

You can view in the following **show run policy-map** command on how the priority levels are used to configure the shaper.

```
router#show run policy-map pq_test
Building configuration...

Current configuration : 590 bytes
!
policy-map pq_test
class qg1
priority level 1 percent 20
queue-limit percent 10
class qg0
priority level 2 percent 10
queue-limit percent 10
class qg2
bandwidth remaining percent 15
queue-limit percent 10
class qg3
bandwidth remaining percent 20
queue-limit percent 10
class qg4
bandwidth remaining percent 25
queue-limit percent 10
class qg5
bandwidth remaining percent 10
queue-limit percent 10
class qg6
bandwidth remaining percent 25
queue-limit percent 10
class class-default
```

```
bandwidth remaining percent 5
queue-limit percent 10
!
end
```


- Restrictions for Priority Shaper, on page 18
- Configuring Priority Shaper, on page 18

Restrictions for Priority Shaper

- Priority Shaper is supported only for PHB level classes.
- Egress QoS Policy map with Priority Shaper can be applied only on the member interface of port channel and not at the logical level.
- Policer configuration is not supported with the Priority Shaper configuration under same class map.
- Priority Traffic Latency is increased during congestion with Priority Shaper configuration at Q level. Configure the queue limit with a lesser value for the priority queue to reduce the latency of priority traffic.
- If the packet is from a 10G interface to a 1G interface, the bustiness is introduced. Due to this, dequeuing rate of this strict priority queue may be sometimes more than enqueuing. As a result, very few packet counters are seen in other queues.

Configuring Priority Shaper

Perform the following steps to configure Priority Shaper.

Procedure

Step 1 **enable**

Example:

```
Device> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 2 **configure terminal**

Example:

```
Device# configure terminal
```

Enters global configuration mode.

Step 3 **class-map** *class-map-name*

Example:

```
Device(config)#class-map class_priority
```

Configures class map and specifies the name of the class map to be created.

Step 4 **match qos-group** *number*

Example:

```
Device(config-cmap)# match qos-group 1
```

Matched different PHBs for different class maps.

Step 5 **policy-map** *policy-map-name*

Example:

```
Device(config)#policy-map shape_priority
```

Configures the policy map.

Step 6 **class** *class-map-name*

Example:

```
Device(config-pmap)#class class_priority
```

Specifies the name of the class whose policy you want to create and enters policy-map class configuration mode. This class is associated with the class map that is created earlier.

Step 7 **priority level** *<level 1/2 >* **percent** *<percentage 1-100 >* or **priority level** <**level 1/2**> *<kbps>* *<burst size>*

Example:

```
Device(config-pmap-c)# priority <1-10000000> Kilo Bits per second
Device(config-pmap-c)# priority Percent <1-100>
Device(config-pmap-c)# priority level <1-2> <1-10000000> Kilo Bits per second
Device(config-pmap-c)# priority level <1-2> percent <1-100>
```

Assigns priority to a traffic class at the priority level specified.

Note **level** is the level of priority assigned to the priority class. Valid values are 1 (high priority) and 2 (low priority). The default value is 1. Do not specify the same priority level for two different classes in the same policy map.

Step 8 **interface** *interface-type interface-number*

Example:

```
Device(config)# interface gigabitethernet 0/0/1
```

Specifies the port to attach to the policy map and allows to enter the interface configuration mode. Valid interfaces are physical ports.

Step 9 **service-policy output** *policy-map-name*

Example:

```
Device(config-if)# service instance 1 ethernet
Device(config-if-srv)# service-policy output shape_priority
```

Applies output policy to the interface.

Note You can also attach the service policy over the service instance.

Step 10 end

Example:

```
Device(config)#end
```

Returns to privileged EXEC mode.

Configuration Examples for Priority Shaper

This section shows sample configurations for Priority Shaper.

Example: Configuring Priority Shaper

The following is a sample configuration for priority shaper.

```
Device(config)#class-map match-any class_level1
Device(config-cmap)#match qos-group 1
Device(config-cmap)#match qos-group 2
Device(config-cmap)#class-map match-any class_level2
Device(config-cmap)#match qos-group 3
Device(config-cmap)#match qos-group 4
Device(config-cmap)#class-map match-any class_bw
Device(config-cmap)#match qos-group 5
Device(config-cmap)#end

.
Device(config)#policy-map shape_priority
Device(config-pmap)#class class_level1
Device(config-pmap-c)#priority level 1 per 10
Device(config-pmap-c)#class class_level2
Device(config-pmap-c)#priority level 2 per 20
Device(config-pmap-c)#class class_bw
Device(config-pmap-c)#bandwidth remaining percent 70
Device(config-pmap-c)#end


Device(config)#interface GigabitEthernet0/0/3
Device(config-if)#load-interval 30
Device(config-if)#service-policy input shape_priority
Device(config-if)#end
```

Verifying Priority Shaper

Use the following command to verify that the Priority Shaper feature is configured on your interface.

```
Device# show policy-map interface TenGigabitEthernet0/0/2
show policy-map interface TenGigabitEthernet0/0/2
TenGigabitEthernet0/0/2

  Service-policy output: shape_priority

    queue stats for all priority classes:
      Queueing
      priority level 1
      queue limit 3932 us/ 49152 bytes
      (queue depth/total drops/no-buffer drops) 49476/44577300/0
      (pkts output/bytes output) 2348138/1202246656

    queue stats for all priority classes:
      Queueing
```

```
  priority level 2
  queue limit 1966 us/ 49152 bytes
  (queue depth/total drops/no-buffer drops) 51072/42228358/0
  (pkts output/bytes output) 4697080/2404904960

Class-map: class_priority (match-any)
  46925438 packets, 24025824256 bytes
  30 second offered rate 1871849000 bps, drop rate 1778171000 bps
  Match: qos-group  1
  Match: qos-group  2
  Priority: 10% (100000 kbps), burst bytes 2500000, b/w exceed drops: 44577300

  Priority Level: 1

Class-map: class_priority_level2 (match-any)
  46925438 packets, 24025824256 bytes
  30 second offered rate 1871849000 bps, drop rate 1684485000 bps
  Match: qos-group  3
  Match: qos-group  4
  Priority: 20% (200000 kbps), burst bytes 5000000, b/w exceed drops: 42228358

  Priority Level: 2

Class-map: class_bw (match-any)
  23462719 packets, 12012912128 bytes
  30 second offered rate 935925000 bps, drop rate 281045000 bps
  Match: qos-group  5
  Queueing
  queue limit 393 us/ 49152 bytes
  (queue depth/total drops/no-buffer drops) 49476/7045085/0
  (pkts output/bytes output) 16417634/8405828608
  bandwidth remaining 70%

Class-map: class-default (match-any)
  0 packets, 0 bytes
  30 second offered rate 0000 bps, drop rate 0000 bps
  Match: any

  queue limit 393 us/ 49152 bytes
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0
```