



CHAPTER 3

Configuring QoS Marking Policies

This chapter describes how to configure QoS marking policies to prioritize network traffic.

Information About Policy Maps

Policy maps prioritize network traffic by class. You create policy maps to define how to treat each class of traffic so that it is prioritized for the best quality of service.

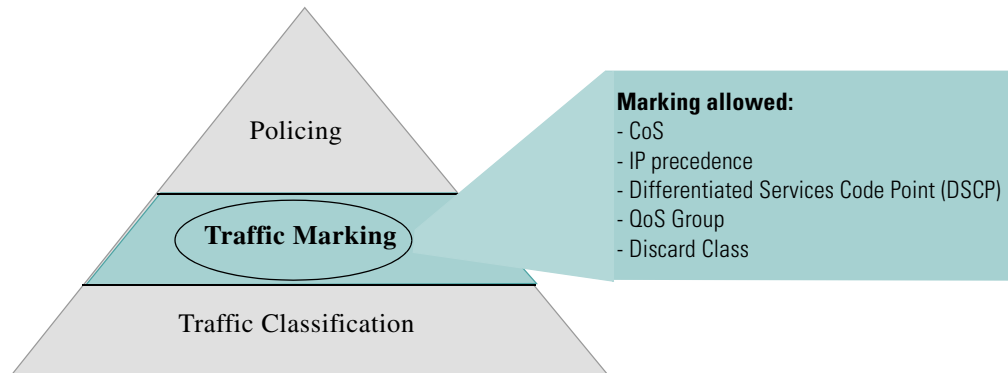
Marking is the process of marking packets, that is changing one of the following in the packet for QoS purposes:

- Differentiated services code point (DSCP)
- Precedence
- CoS

You can map a traffic class to a DSCP, an indicator of the service level for a specified frame. The DSCP value ranges from 0 to 63, and the default is 0. A DSCP value of 46 is disallowed.

Service policies are specified using policy maps. Policy maps provide an ordered mapping of class maps to service levels. You can specify multiple class maps within a policy map, and map a class map to a high, medium, or low service level. The default priority is low. The policy map name is restricted to 63 alphanumeric characters.

The order of the class maps within a policy map is important to determine the order in which the frame is compared to class maps. The first matching class map has the corresponding priority marked in the frame.

Figure 3-1 Packet fields that can be marked

Marking is the setting of QoS information that is related to a packet. You can set the value of standard QoS fields IP precedence, DSCP and Class of Service (CoS), and internal labels that can be used in subsequent actions such as policing.

Once your traffic classes are defined, you can reference them in the policy map where you also define how they should be marked. We recommend keeping the policy simple by using no more than four classes.

The fields available for marking are listed in [Table 3-1](#).

Table 3-1 Fields That Can be Marked

Field	Description
DSCP	Layer 3 Differentiated Service Code Point (DSCP). Note If you mark DSCP, you cannot mark Discard Class.
IP precedence	Layer 3 IP precedence. Note IP precedence uses only the lower 3 bits of the Type of Service (TOS) field. The device overwrites the first 3 bits of the TOS field to 0.
CoS	Layer 2 Class of Service (CoS).
QoS group	Local QoS values that can be marked and matched as needed. The range is from 0 to 126.
Discard class	Local QoS values that can be matched and marked as needed. The range is from 0 to 63. Note If you mark Discard Class, you cannot mark DSCP.
Ingress and egress ports	The marking applies to incoming or outgoing packets.

Unless noted as a restriction, you can mark both incoming and outgoing packets.

Prerequisites for QoS Policies

Marking has the following prerequisites:

- You must have already classified your network traffic. For more information, see the [“Configuring QoS Classification” section on page 2-1](#).
- You are already logged in to the CLI in EXEC mode.

Guidelines and Limitations

Use the following guidelines to configure marking:

- The **set cos** command is applicable only to 802.1Q interfaces, and you can only use it in egress policies.
- If you mark DSCP, you cannot mark Discard Class.
- If you mark Discard Class, you cannot mark DSCP.
- You can only use the **set qos-group** command in ingress policies.
- You can only use the **set discard-class** command in ingress policies.
- When designing your QoS and ACL policies, keep in mind that ACLs referenced within a QoS policy are processed as follows as part of the QoS policy:
 - QoS ingress processing follows ACL processing.
 - QoS egress processing precedes ACL egress processing.

Creating QoS Policies

This section includes the following topics:

- [Creating a DSCP Policy, page 3-3](#)
- [Creating an IP Precedence Policy, page 3-5](#)
- [Creating a Class of Service Policy, page 3-7](#)
- [Creating a QoS Group Policy, page 3-9](#)
- [Creating a Discard Class Policy, page 3-10](#)
- [Creating Ingress and Egress Policies, page 3-12](#)
- [Marking the Port DSCP, page 3-13](#)

Creating a DSCP Policy

Use this procedure to create a policy that marks the DSCP value in the IP header packet to prioritize traffic in a particular class.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- DSCP is described in [RFC 2475](#).
- You are logged in to the CLI in EXEC mode.
- If you use DSCP marking, you cannot use Discard Class marking (see the “[Creating a Discard Class Policy](#)” section on page 3-10).
- You can mark the DSCP field as a numeric value between 0 and 63 or as one of the commonly used values listed in the “[DSCP and Precedence Values](#)” section on page 6-1.

SUMMARY STEPS

1. **config t**
2. **policy-map** [**type qos**] [**match-first**] *policy-map-name*
3. **class** [**type qos**] { *class_map_name* | **class-default** }
4. **set dscp** *value*
5. **show policy-map** *policy-map-name*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Places you into CLI Global Configuration mode.
Step 2	policy-map [type qos] [match-first] policy-map-name Example: switch(config)# policy-map policy1 switch(config-pmap-qos)#	Places you into Policy Map QoS Configuration mode for the specified policy map and configures the map name in the running configuration. Allowable characters: Up to 40 alphabetic, hyphen, or underscore. Characters, are case sensitive.
Step 3	class [type qos] {class_map_name class-default} Example: switch(config-pmap)# class class1 switch(config-pmap-c-qos)#	In Policy Map QoS Configuration mode for the specified policy map, the named class map is referenced. You are then placed into Policy Map Class QoS Configuration mode for the specified class map. Changes are saved in the running configuration. - The default is to reference a new class map at the end of the policy map. class-default: Selects all traffic not currently matched by classes in the policy map.
Step 4	set dscp value Example: switch(config-pmap-c-qos)# set dscp af31 switch(config-pmap-c-qos)#	In Policy Map Class QoS Configuration mode, defines the DSCP value that should be used in all IP headers for the specified class and saves it in the running configuration. You can use a numeric value from 1 to 60, or one of the standard values from the “DSCP and Precedence Values” section on page 6-1. In this example, the standard value of af31 is used.
Step 5	show policy-map policy_map_name Example: switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#	Displays the policy map configuration for the specified map name.
Step 6	copy running-config startup-config Example: switch(config-pmap-c-qos)# copy running-config startup-config [#####] ####] 100% switch(config-pmap-c-qos)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Creating an IP Precedence Policy

You can mark IP Precedence to give priority to all packets in a particular traffic class.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in EXEC mode.
- Table 3-2 lists the RFC 791 precedence values from least to most important.

Table 3-2 Precedence Values

Value	Description
000 (0)	Routine or Best Effort
001 (1)	Priority
010 (2)	Immediate
011 (3)	Flash - mainly used for Voice Signaling or for Video.
100 (4)	Flash Override
101 (5)	Critical -mainly used for Voice RTP.
110 (6)	Internet
111 (7)	Network

SUMMARY STEPS

1. `config t`
2. `policy-map [type qos] [match-first] policy-map-name`
3. `class [type qos] {class_map_name | class-default}`
4. `set precedence value`
5. `show policy-map policy-map-name`
6. `copy running-config startup-config`

DETAILED STEPS

	Command	Purpose
Step 1	<code>config t</code> Example: <code>switch# config t</code> <code>switch(config)#</code>	Places you into CLI Global Configuration mode.
Step 2	<code>policy-map [type qos] [match-first] policy-map-name</code> Example: <code>switch(config)# policy-map policy1</code> <code>switch(config-pmap-qos)#</code>	Places you into Policy Map QoS Configuration mode for the specified policy map and configures the map name in the running configuration. Allowable characters: Up to 40 (alphabetic, hyphen, or underscore). Characters, are case sensitive.

	Command	Purpose
Step 3	class [type qos] { <i>class_map_name</i> class-default } Example: switch(config-pmap-qos)# class class1 switch(config-pmap-c-qos)#	In Policy Map QoS Configuration mode for the specified policy map, the named class map is referenced. You are then placed into Policy Map Class QoS Configuration mode for the specified class map. Changes are saved in the running configuration. - The default is to add the new class map to the end of the policy map. class-default: Selects all traffic not currently matched by classes in the policy map.
Step 4	set precedence <i>value</i> Example: switch(config-pmap-c-qos)# set precedence 3 switch(config-pmap-c-qos)#	In Policy Map Class QoS Configuration mode, adds the precedence value that should be used in all packets for the specified traffic class. The change is saved in the running configuration. You can use a numeric value from 0 to 7, as show in Table 3-2 .
Step 5	show policy-map <i>policy_map_name</i> Example: switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#	Displays the policy map configuration for the specified map name.
Step 6	copy running-config startup-config Example: switch(config-pmap-c-qos)# copy running-config startup-config [#####] 100% switch(config-pmap-c-qos)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Creating a Class of Service Policy

You can mark the CoS field in the IEEE 802.1Q header for all traffic in a specific class.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in EXEC mode.
- You can set CoS in ingress and egress policies.

SUMMARY STEPS

1. **config t**
2. **policy-map** [**type qos**] [**match-first**] *policy-map-name*
3. **class** [**type qos**] {*class_map_name* | **class-default**}
4. **set cos** *cos-value*
5. **show policy-map** *policy-map-name*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Places you into CLI Global Configuration mode.
Step 2	policy-map [type qos] [match-first] <i>policy-map-name</i> Example: switch(config)# policy-map policy1 switch(config-pmap-qos)#	Places you into Policy Map QoS Configuration mode for the specified policy map and configures the map name in the running configuration. Allowable characters: Up to 40 alphabetic, hyphen, or underscore. Characters, are case sensitive.
Step 3	class [type qos] { <i>class_map_name</i> class-default } Example: switch(config-pmap-qos)# class class1 switch(config-pmap-c-qos)#	Places you into Policy Map Class QoS Configuration mode for the specified policy map. A reference is also created to the specified class map. Changes are saved in the running configuration. • The default is to add the class map to the end of the map. • class-default: Selects all traffic not currently matched by classes in the policy map.
Step 4	set cos <i>cos-value</i> Example: switch(config-pmap-c-qos)# set cos 3 switch(config-pmap-c-qos)#	Sets the CoS value to <i>cos-value</i> . The value can range from 0 to 7. You can use this command only in egress policies.
Step 5	show policy-map <i>policy_map_name</i> Example: switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#	Displays the policy map configuration for the specified map name.
Step 6	copy running-config startup-config Example: switch(config-pmap-c-qos)# copy running-config startup-config [#####] 100% switch(config-pmap-c-qos)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Creating a QoS Group Policy

You can mark the locally-defined QoS group value.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You can mark the QoS group value only in ingress policies.
- You are logged in to the CLI in EXEC mode.

SUMMARY STEPS

1. **config t**
2. **policy-map [type qos] [match-first] *policy-map-name***
3. **class [type qos] {*class_map_name* | class-default}**
4. **set qos-group *qos-group-value***
5. **show policy-map *policy-map-name***
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Places you into CLI Global Configuration mode.
Step 2	policy-map [type qos] [match-first] <i>policy-map-name</i> Example: switch(config)# policy-map policy1 switch(config-pmap-qos)#	Places you into Policy Map QoS Configuration mode for the specified policy map and configures the map name in the running configuration. Allowable characters: Up to 40 alphabetic, hyphen, or underscore. Characters, are case sensitive.

	Command	Purpose
Step 3	class [type qos] { <i>class_map_name</i> class-default } Example: switch(config-pmap-qos)# class class1 switch(config-pmap-c-qos)#	Places you into Policy Map Class QoS Configuration mode for the specified policy map. A reference is also created to the specified class map. Changes are saved in the running configuration. - The default is to add the class map to the end of the map. class-default: Selects all traffic not currently matched by classes in the policy map.
Step 4	set qos-group <i>qos-group-value</i> Example: switch(config-pmap-c-qos)# set qos-group 100 switch(config-pmap-c-qos)#	Sets the QoS group value to <i>qos-group-value</i> . The value can range from 0 to 126.
Step 5	show policy-map <i>policy_map_name</i> Example: switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#	Displays the policy map configuration for the specified map name.
Step 6	copy running-config startup-config Example: switch(config-pmap-c-qos)# copy running-config startup-config [#####] 100% switch(config-pmap-c-qos)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Creating a Discard Class Policy

Use this procedure to set a local internal label discard class policy.

BEFORE YOU BEGIN

- If you configure a local internal label discard class policy, you cannot create a DSCP policy. For more information about DSCP policies, see the [“Creating a DSCP Policy” procedure on page 3-3](#).
- You can set a discard class only in ingress policies.
- To reference the local discard class in a policy or in traffic classification use the **match discard-class** command.

For more information, see the [“Configuring Discard Class Classification” procedure on page 2-8](#).

SUMMARY STEPS

1. **config t**
2. **policy-map** [**type qos**] [**match-first**] *policy-map-name*
3. **class** [**type qos**] {*class_map_name* | **class-default**}

4. **set discard-class** *discard-class-value*
5. **show policy-map** *policy-map-name*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Places you into CLI Global Configuration mode.
Step 2	policy-map [type qos] [match-first] <i>policy-map-name</i> Example: switch(config)# policy-map policy1 switch(config-pmap-qos)#	Places you into Policy Map QoS Configuration mode for the specified policy map and configures the map name in the running configuration. Allowable characters: Up to 40 alphabetic, hyphen, or underscore. Characters, are case sensitive.
Step 3	class [type qos] { <i>class_map_name</i> class-default } Example: switch(config-pmap-qos)# class class1 switch(config-pmap-c-qos)#	Places you into Policy Map Class QoS Configuration mode for the specified policy map. A reference is also created to the specified class map. Changes are saved in the running configuration. - The default is to add the class map to the end of the map. class-default: Selects all traffic not currently matched by classes in the policy map.
Step 4	set discard-class <i>discard-class-value</i> Example: switch(config-pmap-c-qos)# set discard-class 40 switch(config-pmap-c-qos)#	Sets the discard class value to <i>discard-class-value</i> . The value can range from 0 to 63.
Step 5	show policy-map <i>policy_map_name</i> Example: switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#	Displays the policy map configuration for the specified map name.
Step 6	copy running-config startup-config Example: switch(config-pmap-c-qos)# copy running-config startup-config [#####] 100% switch(config-pmap-c-qos)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Creating Ingress and Egress Policies

Use this procedure to attach a policy map to an interface or a port profile so that the marking instructions are applied to the ingress or egress packets.

BEFORE YOU BEGIN

- You already know the policy map and interface or port profile you want to use.
- The policy map you want to use is already defined.



Note

You can attach only one input policy and one output policy to an interface or port profile.

SUMMARY STEPS

- `config t`
- `{[interface type number] port-profile name}}`
- `service-policy [type qos] {input | output} policy-map-name [no-stats]`
- `show policy-map policy_map_name`
- `copy running-config startup-config`

DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Places you into CLI Global Configuration mode.
Step 2	{[interface type number port-profile name]} Example: switch(config)# interface ethernet 1/1 switch(config-if)# Example: switch(config)# port-profile accessprofile switch(config-port-prof)#	Places you into Configuration mode for the specified Ethernet or Vethernet interface or port profile. This example shows an Ethernet interface configuration. This example shows a port profile configuration.
Step 3	service-policy [type qos] {input output} policy-map-name [no-stats]	(Optional) Attaches a policy map name that will be added to the input or output packets of the interface or port profile. Note You can attach only one input policy and one output policy to an interface or port profile.

	Command	Purpose
	Example: <pre>switch(config-if)# service-policy input policy1 switch(config-if)#</pre>	This example shows an Ethernet interface configuration.
	Example: <pre>switch(config-port-prof)# service-policy input policy1 switch(config-port-prof)#</pre>	This example shows a port profile configuration.
Step 4	show policy-map <i>policy_map_name</i> Example: <pre>switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#</pre>	Displays the policy map configuration for the specified map name.
Step 5	copy running-config startup-config Example: <pre>switch(config-pmap-c-qos)# copy running-config startup-config [#####] 100% switch(config-pmap-c-qos)#</pre>	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Marking the Port DSCP

Use this procedure to mark the DSCP port for each class of traffic defined in a specified ingress or egress policy map.

BEFORE YOU BEGIN

- The default behavior is to preserve the DSCP value, or to trust DSCP. To make the port untrusted, change the DSCP value.
- Unless you configure a QoS policy and attach that policy to specified interfaces, the DSCP value is preserved.



Note

You can attach only one input policy and one output policy to an interface or port profile.

SUMMARY STEPS

1. **config t**
2. **policy-map [type qos] [match-first] *policy-map-name***
3. **class [type qos] {*class_map_name* | class-default }**
4. **set dscp-value**
5. **exit**
6. **class [type qos] {*class_map_name* | class-default }**

7. **set dscp-value**
8. **exit**
9. **class [type qos] {class_map_name | class-default}**
10. **set dscp-value**
11. **exit**
12. **exit**
13. **{[interface type number] port-profile name}}**
14. **service-policy [type qos] {input | output} policy-map-name [no-stats]**
15. **show policy-map policy_map_name**
16. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Places you into CLI Global Configuration mode.
Step 2	policy-map [type qos] [match-first] policy-map-name Example: switch(config)# policy-map policy1 switch(config-pmap-qos)#	Places you into Policy Map QoS Configuration mode for the specified policy map and configures the map name in the running configuration. Allowable characters: Up to 40 alphabetic, hyphen, or underscore. Characters, are case sensitive.
Step 3	class [type qos] {class_map_name class-default} Example: switch(config-pmap)# class class1 switch(config-pmap-c-qos)#	Places you into Policy Map Class QoS Configuration mode for the specified policy map. A reference is also created to the specified class map which is saved in the running configuration. - The default is to add the class map to the end of the map. class-default: Selects all traffic not currently matched by classes in the policy map.
Step 4	set dscp-value Example: switch(config-pmap-c-qos)# set dscp af31 switch(config-pmap-c-qos)#	Sets a DSCP value. Valid values are shown in the “DSCP and Precedence Values” section on page 6-1.
Step 5	exit Example: switch(config-pmap-c-qos)# exit switch(config-pmap-qos)#	Returns you to Policy Map Configuration mode.

	Command	Purpose
Step 6	class [type qos] { <i>class_map_name</i> class-default } Example: switch(config-pmap-qos)# class class2 switch(config-pmap-c-qos)#	- In the policy map, creates a reference to the specified class map name, and then places you into Policy-map Class Configuration mode. - Adds the class to the end of the policy map. - Specify class-default to select all traffic not currently matched by classes in the policy map.
Step 7	set dscp-value Example: switch(config-pmap-c-qos)# set dscp af13 switch(config-pmap-c-qos)#	Sets the DSCP value to <i>dscp-value</i> . Valid values are shown in the “ DSCP and Precedence Values ” section on page 6-1.
Step 8	exit Example: switch(config-pmap-c-qos)# exit switch(config-pmap-qos)#	Returns to Policy Map Configuration mode.
Step 9	class [type qos] { <i>class_map_name</i> class-default } Example: switch(config-pmap-qos)# class class-default switch(config-pmap-c-qos)#	- Creates a reference to the specified class map. - Places you into Policy Map Class Configuration mode. - Adds the class to the end of the policy map. - Specify class-default to select all traffic not currently matched by classes in policy map.
Step 10	set dscp-value Example: switch(config-pmap-c-qos)# set dscp af22 switch(config-pmap-c-qos)#	Sets the DSCP value to <i>dscp-value</i> . Valid values are shown in the “ DSCP and Precedence Values ” section on page 6-1.
Step 11	exit Example: switch(config-pmap-c-qos)# exit switch(config-pmap-qos)#	Returns you to Policy Map Configuration mode.
Step 12	exit Example: switch(config-pmap)# exit switch(config)#	Returns you to Global Configuration mode.
Step 13	{[interface type number port-profile name]} Example: switch(config)# interface ethernet 1/1 switch(config-if)# Example: switch(config)# port-profile accessprofile switch(config-port-prof)#	Places you into Configuration mode for the specified Ethernet or Vethernet interface or port profile. This example shows an Ethernet interface configuration. This example shows a port profile configuration.

	Command	Purpose
Step 14	service-policy [type qos] {input output} <i>policy-map-name</i> [no-stats]	(Optional) Attaches a policy map name that will be added to the input or output packets of the interface or port profile. Note You can attach only one input policy and one output policy to an interface or port profile.
	Example: switch(config-if)# service-policy input policy1 switch(config-if)#	This example shows an Ethernet interface configuration.
	Example: switch(config-port-prof)# service-policy input policy1 switch(config-port-prof)#	This example shows a port profile configuration.
Step 15	show policy-map <i>policy_map_name</i> Example: switch(config-pmap-c-qos)# show policy-map policy1 switch(config-pmap-c-qos)#	Displays the policy map configuration for the specified map name.
Step 16	copy running-config startup-config Example: switch(config-pmap-c-qos)# copy running-config startup-config [#####] 100% switch(config-pmap-c-qos)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Verifying the Policy Configuration

Use the commands in this section to verify the policy configuration.

Command	Description
show policy-map [type qos] [name <i>policy_map_name</i>]	Display the policy map configuration.
show table-map <i>name</i>	Display the table map configuration.

Example 3-1 show policy-map policy_map_name

```
n1000v(config)# show policy-map policy-ipacl
Type qos policy-maps
=====
policy-map type qos policy-ipacl
  class class-ipacl
    set dscp 10
```

Example 3-2 show policy-map interface

```
n1000v# show policy-map interface brief
```

```

Interface/VLAN [Status]:INP QOS      OUT QOS      INP QUE      OUT QUE
=====
Vethernet1     [Active]:      media
Vethernet10    [Active]:      media
Vethernet13    [Active]:web_policer
Vethernet15    [Active]:iperf
Vethernet16    [Active]:      iperf_policer
Vethernet17    [Active]:ixia_in  ixia_out
Vethernet18    [Active]:      media
Vethernet19    [Active]:iperf
Vethernet20    [Active]:      iperf_policer
Vethernet21    [Active]:netperf_polic
=====

```

Feature History for QoS Marking Policies

This section provides the QoS marking policies release history.

Feature Name	Releases	Feature Information
QoS Marking Policies	4.0	This feature was introduced.

