Configuring Wireless QoS

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 at the end of this module.

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Prerequisites for Wireless QoS

Before configuring wireless QoS, you must have a thorough understanding of these items:

- QoS concepts.
- Wireless concepts and network topologies.
- Classic Cisco IOS QoS.
- Modular QoS CLI (MQC).
- Understanding of QoS implementation.
- The types of applications used and the traffic patterns on your network.

- Traffic characteristics and needs of your network. For example, is the traffic on your network bursty? Do you need to reserve bandwidth for voice and video streams?
- Bandwidth requirements and speed of the network.
- Location of congestion points in the network.

Restrictions for QoS on Wireless Targets

General Restrictions

A target is an entity where a policy is applied. You can apply a policy to either a wired or wireless target. A wired target can be either a port or VLAN. A wireless target can be either a port, radio, SSID, or client. Only port, SSID, and client policies are user configurable. Radio polices are not user configurable. Wireless QoS policies for port, radio, SSID, and client are applied in the downstream direction, and for upstream only SSID and client targets are supported. Downstream indicates that traffic is flowing from the switch to the wireless client. Upstream indicates that traffic is flowing from wireless client to the switch.

- Only port, SSID, and client (using AAA and Cisco IOS command-line interface) policies are user-configurable. Radio policies are set by the wireless control module and are not user-configurable.
- Port and radio policies are applicable only in the egress direction.
- SSID and client targets can be configured only with marking and policing policies.
- One policy per target per direction is supported.
- For the egress class-default SSID policy, you must configure the queue buffer ratio as 0 after you configure the average shape rate.
- You cannot delete a group of WLANs or QoS policy.

Wireless QoS Restrictions on Ports

The following are restrictions for applying QoS features on a wireless port target:

- All wireless ports have similar parent policy with one class-default and one action shape under class-default. Shape rates are dependent on the 802.11a/b/g/ac bands.
- You can create a maximum of four classes in a child policy by modifying the `port_chlid_policy`.
- If there are four classes in the `port_child_policy` at the port level, one must be a non-client-nrt class and one must be class-default.
- No two classes can have the same priority level. Only priority level 1 (for voice traffic and control traffic) and 2 (for video) are supported.
- Priority is not supported in the multicast NRT class (non-client-nrt class) and `class-default`.
- If four classes are configured, two of them have to be priority classes. If only three classes are configured, at least one of them should be a priority class. If three classes are configured and there is no non-client-nrt class, both priority levels must be present.
- Only match DSCP is supported.
- The port policy applied by the wireless control module cannot be removed using the CLI.

- Both priority rate and police CIR (using MQC) in the same class is unsupported.
- Queue limit (which is used to configure Weighted Tail Drop) is unsupported.

Wireless QoS Restrictions on SSID

The following are restrictions for applying QoS features on SSID:

- One table map is supported at the ingress policy.
- Table maps are supported for the parent class-default only. Up to two table maps are supported in the egress direction and three table-maps can be configured when a QoS group is involved.

Note Table-maps are not supported at the client targets.

- If a wireless port has a default policy with only two queues (one for multicast-NRT, one for class-default), the policy at SSID level cannot have voice and video class in the egress direction.
- Policing without priority is not supported in the egress direction.
- Priority configuration at the SSID level is used only to configure the RT1 and RT2 policers (AFD for policer). Priority configuration does not include the shape rate. Therefore, priority is restricted for SSID policies without police.
- The mapping in the DSCP2DSCP and COS2COS table should be based on the classification function for the voice and video classes in the port level policy.
- No action is allowed under the class-default of a child policy.
- For SSID ingress policies, only UP and DSCP filters (match criteria) are supported. ACL and protocol match criteria are not supported.
- For a flat policy (non hierarchical), in the ingress direction, the policy configuration must be a set (table map) or policing or both.

Wireless QoS Restrictions on Clients

The following are restrictions for applying QoS policies on client targets:

- The default client policy is enabled only on WMM clients that are ACM-enabled.
- Queuing is not supported.
- Attaching, removing, or modifying client policies on a WLAN in the enabled state is not supported. You must shut down the WLAN to apply, remove, or modify a policy.
- Table-map configuration is not supported for client targets.
- Policing and set configured together in class-default is blocked in egress direction:

```
policy-map foo
class class-default
police X
set dscp Y
```

- Child policy is not supported under class-default if the parent policy contains other user-defined class maps in it.

- For flat egress client policy, policing in class-default and marking action in other classes are not supported.
- All the filters in classes in a policy map for client policy must have the same attributes. Filters matching on protocol-specific attributes such as IPv4 or IPv6 addresses are considered as different attribute sets.
- For filters matching on ACLs, all ACEs (Access Control Entry) in the access list should have the same type and number of attributes.
- In client egress policies, all filters in the policy-map must match on the same marking attribute for filters matching on marking attributes. For example, If filter matches on DSCP, then all filters in the policy must match on DSCP.
- ACL matching on port ranges and subnet are only supported in ingress direction.

Related Topics

Queuing in Wireless, on page 11
Port Policy Format, on page 9
Port Policies, on page 6
Radio Policies, on page 7
Restrictions for QoS on Wired Targets

Information about Wireless QoS

Wireless QoS Overview

The flow of traffic from a wired source to a wireless target is known as downstream traffic. The flow of traffic from a wireless source to a wired target is known as upstream traffic.

- Wireless ports, including all physical ports to which an access point can be associated.
- Radio
- SSID (applicable on a per-radio, per-AP, and per-SSID)
- Client

Port, SSID, and client policies are user configurable. Radio policies are controlled by the wireless control module.

A target is the entity where the policy is applied. Wireless QoS policies for port, SSID, client, and radio are applied in the downstream direction. That is, when traffic is flowing from the switch to wireless client.

Note Only SSID and client policies are supported in both egress and ingress direction.

The following are some of the specific features provided by wireless QoS:

- Policies on wireless QoS targets:
  - Port

- Radio
- SSID
- Client

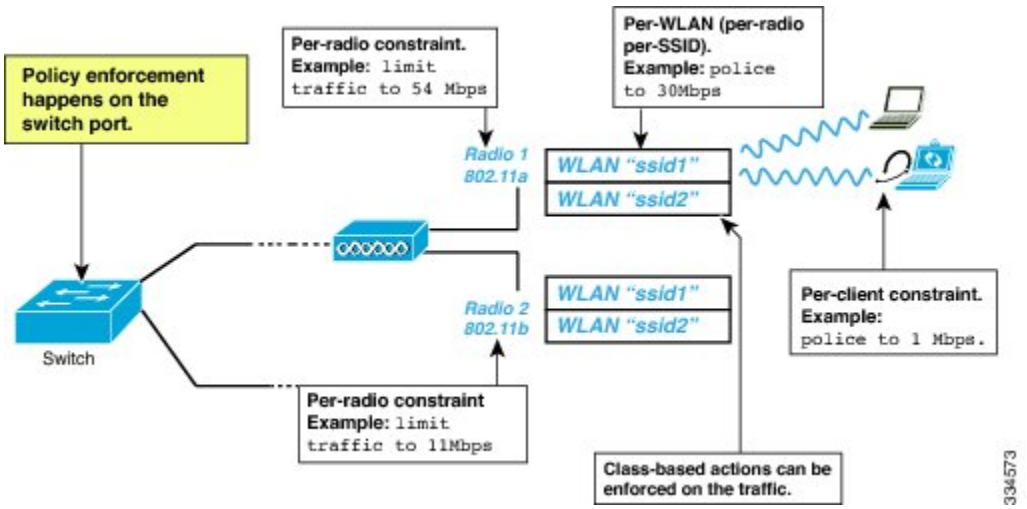
- Queuing support
- Policing of wireless traffic
- Shaping of wireless traffic
- Rate limiting in both downstream and upstream direction
- Approximate Fair Drop (AFD). AFD is configured using shaping in SSID policies and policing in client policies. Queue limits are not defined on AFT policiers in clients.
- Mobility support for QoS
- Compatibility with precious metal QoS policies available on Cisco Unified Wireless Controllers.

Hierarchical Wireless QoS

The switch supports hierarchical QoS for wireless targets. Hierarchical QoS policies are applicable on port, radio, SSID, and client. QoS policies configured on the device (including marking, shaping, policing) can be applied across the targets. If the network contains non-realtime traffic, the non-realtime traffic is subject to approximate fair drop. Hierarchy refers to the process of application of the various QoS policies on the packets arriving to the device. You can configure policing in both the parent and child policies.

This figure shows the various targets available on a wireless network, as well as a hierarchal wireless configuration. Wireless QoS is applied per-radio constraint, per-WLAN, and per-client constraint.

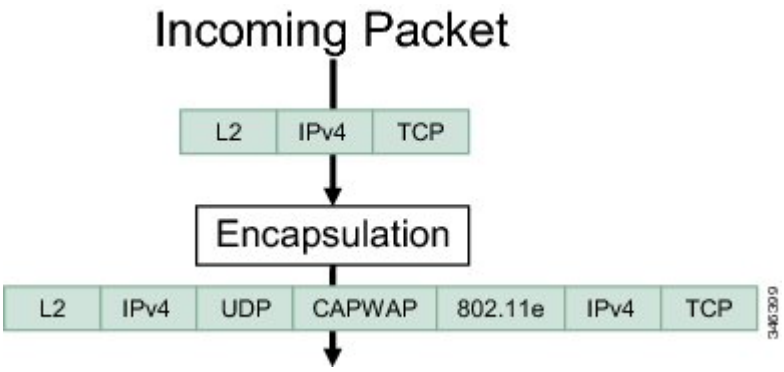
Figure 1: Hierarchical QoS



Wireless Packet Format

This figure displays the wireless packet flow and encapsulation used in hierarchical wireless QoS. The incoming packet enters the switch. The switch encapsulates this incoming packet and adds the 802.11e and CAPWAP headers.

Figure 2: Wireless Packet Path in the Egress Direction during First Pass



Hierarchical AFD

Approximate Fair Dropping (AFD) is a feature provided by the QoS infrastructure in Cisco IOS. For wireless targets, AFD can be configured on SSID (via shaping) and clients (via policing). AFD shaping rate is only applicable for downstream direction. Unicast real-time traffic is not subjected to AFD drops.

Wireless QoS Targets

This section describes the various wireless QoS targets available on a switch.

Port Policies

The switch supports port-based policies. The port policies includes port shaper and a child policy (port_child_policy).

Note Port child policies only apply to wireless ports and not to wired ports on the switch. A wireless port is defined as a port to which APs join. A default port child policy is applied on the switch to the wireless ports at start up.The port shaper rate is limited to 1G

Port shaper specifies the traffic policy applicable between the device and the AP. This is the sum of the radio rates supported on the access point.

The child policy determines the mapping between packets and queues defined by the port-child policy. The child policy can be configured to include voice, video, class-default, and non-client-nrt classes where voice and video are based on DSCP value (which is the outer CAPWAP header DSCP value). The definition of class-default is known to the system as any value other than voice and video DSCP.

The DSCP value is assigned when the packet reaches the port. Before the packet arrives at the port, the SSID policies are applied on the packet. Port child policy also includes multicast percentage for a given port traffic. By default, the port child policy allocates up to 10 percent of the available rate.

Related Topics

Queuing in Wireless, on page 11
Restrictions for QoS on Wireless Targets, on page 2
Supported QoS Features on Wireless Targets, on page 8
Examples: Wireless QoS Policy Classified by Voice, Video, and Multicast Traffic, on page 20

Radio Policies

The radio policies are system defined and are not user configurable. Radio wireless targets are only applicable in the egress direction.

Radio policies are applicable on a per-radio, per-access point basis. The rate limit on the radios is the practical limit of the AP radio rate. This value is equivalent to the sum of the radios supported by the access point.

The following radios are supported:

- 802.11 a/n
- 802.11 b/n

Related Topics

Restrictions for QoS on Wireless Targets, on page 2
Supported QoS Features on Wireless Targets, on page 8

SSID Policies

You can create QoS policies on SSID BSSID (Basic Service Set Identification) in both the ingress and egress directions. By default, there is no SSID policy. You can configure an SSID policy based on the SSID name. The policy is applicable on a per BSSID.

The types of policies you can create on SSID include marking by using table maps (table-maps), shape rate, and RT1 (Real Time 1) and RT2 (Real Time 2) policiers. If traffic is ingress, you usually configure a marking policy on the SSID. If traffic is downstream, you can configure marking and queuing.

There should be a one-to-one mapping between the policies configured on a port and an SSID. For example, if you configure class voice and class video on the port, you can have a similar policy on the SSID.

SSID priorities can be specified by configuring bandwidth remaining ratio. Queuing SSID policies are applied in the egress direction.

Related Topics

Supported QoS Features on Wireless Targets, on page 8
Examples: SSID Policy, on page 20
Examples: Configuring Downstream SSID Policy, on page 21

Client Policies

Client policies are applicable in the ingress and egress direction. The wireless control module of the switch applies the default client policies when admission control is enabled for WMM clients. When admission control is disabled, there is no default client policy. You can configure policing and marking policies on clients.

You can configure client policies in the following ways:

- Using AAA
- Using the Cisco IOS MQC CLI
  - You can use **service policy client** command in the WLAN configuration.
- Using the default configuration

Note If you configured AAA by configuring the unified wireless controller procedure, and using the MQC QoS commands, the policy configuration performed through the MQC QoS commands takes precedence.

Note When applying client policies on a WLAN, you must disable the WLAN before modifying the client policy. SSID policies can be modified even if the WLAN is enabled.

Related Topics

Supported QoS Features on Wireless Targets, on page 8
Examples: Client Policies, on page 22

Supported QoS Features on Wireless Targets

This table describes the various features available on wireless targets.

Table 1: QoS Features Available on Wireless Targets

Target	Features	Traffic	Direction Where Policies Are Applicable	Comments
Port	• Port shaper • Priority queuing • Multicast policing	Non-Real Time (NRT), Real Time (RT)	Downstream	
Radio	• Shaping	Non-Real Time	Downstream	Radio policies are not user configurable.

Target	Features	Traffic	Direction Where Policies Are Applicable	Comments
SSID	• Shaping • Police • Table map • BRR	Non-Real Time, Real Time	Upstream and downstream	Queuing actions such as shaping and BRR are allowed only in the downstream direction.
Client	• Set • Police	Non-Real Time, Real time	Upstream and downstream	

Related Topics

Queuing in Wireless, on page 11
Port Policy Format, on page 9
Port Policies, on page 6
Radio Policies, on page 7
SSID Policies, on page 7
Client Policies, on page 8

Port Policy Format

This section describes the behavior of the port policies on a switch. The ports on the switch do not distinguish between wired or wireless physical ports. Depending on the kind of device associated to the switch, the policies are applied. For example, when an access point is connected to a switch port, the switch detects it as a wireless device and applies the default hierarchical policy which is in the format of a parent-child policy. This policy is an hierarchical policy. The parent policy cannot be modified but the child policy (port-child policy) can be modified to suit the QoS configuration. The switch is pre configured with a default class map and a policy map.

Default class map:

```
Class Map match-any non-client-nrt-class
   Match non-client-nrt
```

The above port policy processes all network traffic to the Q3 queue. You can view the class map by executing the **show class-map** command.

Default policy map:

```
Policy Map port_child_policy
    Class non-client-nrt-class
      bandwidth remaining ratio 10
```

Note The class map and policy map listed are system-defined policies and cannot be changed.

The following is the system-defined policy map available on the ports on which wireless devices are associated. The format consists of a parent policy and a service child policy (**port_child_policy**). To customize the policies to suite your network needs, you must configure the port child policy.

```
Policy-map policy_map_name
    Class class-default
         Shape average average_rate
         Service-policy port_child_policy
```

Note The parent policy is system generated and cannot be changed. You must configure the *port_child_policy* policy to suit the QoS requirements on your network.

Depending on the type of traffic in your network, you can configure the port child policy. For example, in a typical wireless network deployment, you can assign specific priorities to voice and video traffic. Here is an example:

```
Policy-map port_child_policy
     Class  voice-policy-name (match dscp ef)
          Priority level 1
          Police (multicast-policer-name-voice) Multicast Policer
    Class video-policy-name (match dscp af41)
        Priority level 2
        Police (multicast-policer-name-video) Multicast Policer
Class non-client-nrt-class traffic(match non-client-nrt)
        Bandwidth remaining ratio (brr-value-nrt-q2)
    Class class-default  (NRT Data)
        Bandwidth remaining ratio (brr-value-q3)
```

In the above port child policy:

- *voice-policy-name*— Refers to the name of the class that specifies rules for the traffic for voice packets. Here the DSCP value is mapped to a value of 46 (represented by the keyword **ef**). The voice traffic is assigned the highest priority of 1.
- *video-policy-name*— Refers to the name of the class that specifies rules for the traffic for video packets. The DSCP value is mapped to a value of 34 (represented by the keyword **af41**).
- *multicast-policer-name-voice*— If you need to configure multicast voice traffic, you can configure policing for the voice class map.
- *multicast-policer-name-video*— If you need to configure multicast video traffic, you can configure policing for the video class map.

In the above sample configuration, all voice and video traffic is directed to the Q0 and Q1 queues, respectively. These queues maintain a strict priority. The packets in Q0 and Q1 are processed in that order. The bandwidth remaining ratios *brr-value-nrt-q2* and *brr-value-q3* are directed to the Q2 and Q3 respectively specified by the class maps and *class-default* and *non-client-nrt*. The processing of packets on Q2 and Q3 are based on a weighted round-robin approach. For example, if the *brr-value-nrtq2* has a value of 90 and *brr-value-nrtq3* is 10, the packets in queue 2 and queue 3 are processed in the ratio of 9:1.

Related Topics

Queuing in Wireless, on page 11

Restrictions for QoS on Wireless Targets, on page 2
Supported QoS Features on Wireless Targets, on page 8
Examples: Wireless QoS Policy Classified by Voice, Video, and Multicast Traffic, on page 20

Wireless QoS Rate Limiting

QoS per Client Rate Limit—Wireless

QoS policies can be configured to rate-limit client traffic using policiers. Ths includes both real-time and non real time traffic. The non real-time traffic is policed using AFD policiers. These policiers can only be one rate two color.

Note For client policy, the voice and video rate limits are applied at the same time.

QoS Upstream and Downstream SSID Rate Limit—Wireless

Upstream and downstream rate limiting is done using policing at the SSID level. AFD cannot drop real-time traffic, it can only be policed in the traffic queues. Real-time policing and AFD shaping is performed at the SSID level. The policiers can only be one rate two color.

The radio has a default shaping policy. This shaping limit is the physical limit of the radio itself. You can check the policy maps on the radio by using the **show policy-map interface wireless radio** command.

Wireless QoS Multicast

You can configure multicast policing rate at the port level.

Queuing in Wireless

Queuing in the wireless component is performed based on the port policy and is applicable only in the downstream direction. The wireless module supports the following four queues:

- Voice—This is a strict priority queue. Represented by Q0, this queue processes control traffic and multicast or unicast voice traffic. All control traffic (such as CAPWAP packets) is processed through the voice queue. The QoS module uses a different threshold within the voice queue to process control and voice packets to ensure that control packets get higher priority over other non-control packets.
- Video—This is a strict priority queue. Represented by Q1, this queue processes multicast or unicast video traffic.
- Data NRT—Represented by Q2, this queue processes all non-real-time unicast traffic.
- Multicast NRT—Represented by Q3, this queue processes Multicast NRT traffic. Any traffic that does not match the traffic in Q0, Q1, or Q2 is processed through Q3.

Note By default, the queues Q0 and Q1 are not enabled.

Note A weighted round-robin policy is applied for traffic in the queues Q2 and Q3.

For upstream direction only one queue is available. Port and radio policies are applicable only in the downstream direction.

Note The wired ports support eight queues.

Related Topics

Port Policy Format, on page 9
Port Policies, on page 6
Restrictions for QoS on Wireless Targets, on page 2
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Examples: Wireless QoS Policy Classified by Voice, Video, and Multicast Traffic, on page 20

Wireless QoS Mobility

Wireless QoS mobility enables you to configure QoS policies so that the network provides the same service anywhere in the network. A wireless client can roam from one location to another and as a result the client can get associated to different access points associated with a different switch. Wireless client roaming can be classified into two types:

- Intra-switch roaming
- Inter-switch roaming

Note The client policies must be available on all of the switches in the mobility group. The same SSID and port policy must be applied to all switches in the mobility group so that the clients get consistent treatment.

Inter-Switch Roaming

When a client roams from one location to another, the client can get associated to access points either associated to the same switch (anchor switch) or a different switch (foreign switch). Inter-switch roaming refers to the scenario where the client gets associated to an access point that is not associated to the same device before the client roamed. The host device is now foreign to the device to which the client was initially anchored.

In the case of inter-switch roaming, the client QoS policy is always executed on the foreign controller. When a client roams from anchor switch to foreign switch, the QoS policy is uninstalled on the anchor switch and installed on the foreign switch. In the mobility handoff message, the anchor device passes the name of the

policy to the foreign switch. The foreign switch should have a policy with the same name configured for the QoS policy to be applied correctly.

In the case of inter-switch roaming, all of the QoS policies are moved from the anchor device to the foreign device. While the QoS policies are in transition from the anchor device to the foreign device, the traffic on the foreign device is provided the default treatment. This is comparable to a new policy installation on the client target.

Note If the foreign device is not configured with the user-defined physical port policy, the default port policy is applicable to all traffic is routed through the NRT queue, except the control traffic which goes through RT1 queue. The network administrator must configure the same physical port policy on both the anchor and foreign devices symmetrically.

Intra-Switch Roaming

With intra-switch roaming, the client gets associated to an access point that is associated to the same switch before the client roamed, but this association to the device occurs through a different access point.

Note QoS policies remain intact in the case of intra-switch roaming.

Precious Metal Policies for Wireless QoS

Wireless QoS is backward compatible with the precious metal policies offered by the unified wireless controller platforms. The precious metal policies are system-defined policies that are available on the controller.

The following policies are available:

- Platinum—Used for VoIP clients.
- Gold—Used for video clients.
- Silver— Used for traffic that can be considered best-effort.
- Bronze—Used for NRT traffic.

These policies (also known as profiles) can be applied to a WLAN based on the traffic. We recommend the configuration using the Cisco IOS MQC configuration. The policies are available in the system based on the precious metal policy required. You can configure precious metal policies only for SSID ingress and egress policies.

Based on the policies applied, the 802.1p, 802.11e (WMM), and DSCP fields in the packets are affected. These values are preconfigured and installed when the switch is booted.

Note Unlike the precious metal policies that were applicable in the Cisco Unified Wireless controllers, the attributes rt-average-rate, nrt-average-rate, and peak rates are not applicable for the precious metal policies configured on this switch platform.

Related Topics

Configuring Precious Metal Policies , on page 14

How to Configure Wireless QoS

Configuring Precious Metal Policies

You can configure precious metal QoS policies on a per-WLAN basis.

SUMMARY STEPS

1. **configure terminal**
2. **wlan** *wlan-name*
3. **service-policy** {**input** | **output**} *policy-name*
4. **end**
5. **show wlan** {*wlan-id* | *wlan-name*}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global command mode.
Step 2	**wlan** *wlan-name* **Example:** `Switchwlan test4`	Enters the WLAN configuration submode.

Step 3	**service-policy** {**input**	**output**} *policy-name*
		
		Example:
		`Switch(config-wlan)# service-policy output platinum`
		
		Example:
		`Switch(config-wlan)# service-policy input platinum-up`
			Configures the WLAN with the QoS policy. To configure the WLAN with precious metal policies, you must enter one of the following keywords: **platinum**, **gold**, **silver**, or **bronze**. The upstream policy is specified with the keyword **platinum-up** as shown in the example.
			Note Upstream policies differ from downstream policies. The upstream policies have a suffix of -up.

Step 4	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit the global configuration mode.

	Command or Action	Purpose

Step 5	**show wlan** {*wlan-id* | *wlan-name*}
	
	Example:
	`Switch# show wlan name qos-wlan`
		Verifies the configured QoS policy on the WLAN.
		
		`Switch# show wlan name qos-wlan`
		`. . .`
		`. . .`
		`. . .`
		
		`QoS Service Policy - Input`
		`  Policy Name : platinum-up`
		
		`  Policy State : Validated`
		`QoS Service Policy - Output`
		`  Policy Name : platinum`
		`  Policy State : Validated`
		`. . .`
		
		`. . .`

Related Topics

Precious Metal Policies for Wireless QoS, on page 13

Configuring Class Maps for Voice and Video

To configure class maps for voice and video traffic, follow these steps:

SUMMARY STEPS

1. **configure terminal**
2. **class-map** *class-map-name*
3. **match dscp** *dscp-value-for-voice*
4. **end**
5. **configure terminal**
6. **class-map** *class-map-name*
7. **match dscp** *dscp-value-for-video*
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**class-map** *class-map-name* **Example:** `Switch(config)# class-map voice`	Creates a class map.
Step 3	**match dscp** *dscp-value-for-voice* **Example:** `Switch(config-cmap)# match dscp 46`	Matches the DSCP value in the IPv4 and IPv6 packets. Set this value to 46.
Step 4	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.
Step 5	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 6	**class-map** *class-map-name* **Example:** `Switch(config)# class-map video`	Configures a class map.
Step 7	**match dscp** *dscp-value-for-video* **Example:** `Switch(config-cmap)# match dscp 34`	Matches the DSCP value in the IPv4 and IPv6 packets. Set this value to 34.
Step 8	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Client Policies

Before You Begin

You must have the following features configured before configuring client policies:

- Access lists
- Access group name

SUMMARY STEPS

1. **configure terminal**
2. **ip access-list extended** *ext-name*
3. **permit ip host** *host-ip-address*
4. **end**
5. **configure terminal**
6. **class map** *acl-name*
7. **match access-group name** *access-list-name*
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 2	**ip access-list extended** *ext-name* **Example:** `Switch(config)# ip access-list extended`	Configures a named access list.
Step 3	**permit ip host** *host-ip-address* **Example:** `Switch(config-ext-nacl)# permit ip host 203.0.113.3 host 203.0.113.5`	Configures IP protocol traffic from a source address to a destination address.
Step 4	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.
Step 5	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 6	**class map** *acl-name* **Example:** `Switch(config)# class-map acl-a1`	Configures the class map name.
Step 7	**match access-group name** *access-list-name* **Example:** `Switch(config-cmap)# match access-group name a1`	Assigns the class map to an access group name.

	Command or Action	Purpose
Step 8	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Table Maps

SUMMARY STEPS

1. **configure terminal**
2. table-map *table-map-name*
3. **map from** *from-value* **to** *to-value*
4. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 2	table-map *table-map-name* **Example:** `Switch(config)# table-map mutate-dscp`	Create the table map.

Step 3	**map from** *from-value* **to** *to-value*
	
	Example:
	
	`Switch(config-tablemap)# map from 10 to 34`
	`Switch(config-tablemap)# map from 34 to 40`
	`Switch(config-tablemap)# map from 46 to 48`
		Map a to value to a from value.

Step 4	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Applying an SSID or Client Policy on a WLAN

Before You Begin

You must have a service-policy map configured before applying it on an SSID.

SUMMARY STEPS

1. **configure terminal**
2. **wlan** *profile-name*
3. **service-policy** [**input** | **output**] *policy-name*
4. **service-policy client** [**input** | **output**] *policy-name*
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 2	**wlan** *profile-name* **Example:** `Switch# wlan test4`	Enters the WLAN configuration submode. The *profile-name* is the profile name of the configured WLAN.
Step 3	**service-policy** [**input**	**output**] *policy-name* **Example:** `Switch(config-wlan)# service-policy input policy-map-ssid`	Applies the policy. The following options are available: • **input—** Assigns the policy map to WLAN ingress traffic. • **output—** Assigns the policy map to WLAN egress traffic.
Step 4	**service-policy client** [**input**	**output**] *policy-name* **Example:** `Switch(config-wlan)# service-policy client input policy-map-client`	Applies the policy. The following options are available: • **input—** Assigns the client policy for ingress direction on the WLAN. • **output—** Assigns the client policy for egress direction on the WLAN.
Step 5	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuration Examples

Examples: Wireless QoS Policy Classified by Voice, Video, and Multicast Traffic

The following example provides a template for creating a port child policy for managing quality of service for voice and video traffic.

```
Policy-map port_child_policy
    Class voice (match dscp ef)
            Priority level 1
            Police  Multicast Policer
    Class video (match dscp af41)
            Priority level 2
            Police  Multicast Policer
    Class mcast-data  (match non-client-nrt)
            Bandwidth remaining ratio <>
    Class class-default  (NRT Data)
            Bandwidth remaining ratio <>
```

Note Multicast Policer in the example above is not a keyword. It refers to the policing policy configured.

Two class maps with name voice and video are configured with DSCP assignments of 46 and 34. The voice traffic is assigned the priority of 1 and the video traffic is assigned the priority level 2 and is processed using Q0 and Q1. If your network receives multicast voice and video traffic, you can configure multicast policers. The non-client NRT data and NRT data are processed using the Q2 and Q3 queues.

Related Topics

Queuing in Wireless, on page 11
Port Policy Format, on page 9
Port Policies, on page 6

Examples: SSID Policy

SSID Policy 1

The following is an example of an SSID policy for voice and video:

```
Policy-map enterprise-ssid-1
     Class  voice (match dscp ef)
          Priority level 1
         Police Unicast Policer
Class video (match dscp af41)
        Priority level 2
        Police Unicast Policer
Policy-map ssid-shaper
Class class-default  (NRT Data)
        queue-buffer ratio 0
        shape average 100000000
        set wlan-user-priority dscp table dscp2up
```

```
        set dscp dscp table dscp2dscp
        service-policy  enterprise-ssid-1
```

SSID Policy 2

The following is an example of SSID policy configured with an average SSID shaping rate:

```
Policy-map enterprise-ssid-2
     Class  voice (match dscp af11)
          Priority level 1
         Police Unicast Policer
Class video (match dscp  ef)
        Priority level 2
        Police Unicast Policer
Policy-map ssid-shaper
Class class-default  (NRT Data)
       shape average 1000000000
       service-policy enterprise-ssid-2
       set wlan-user-priority dscp table dscp2up
       set dscp dscp table dscp2dscp
```

Related Topics

SSID Policies, on page 7

Examples: Configuring Downstream SSID Policy

To configure a downstream BSSID policy, you must first configure a port child policy with priority level queuing.

Type of Policy	Example

User-defined port child policy	`policy-map port_child_policy`
	`class voice`
	`priority level 1 20000`
	
	`class video`
	`priority level 2 10000`
	
	`class non-client-nrt-class`
	`bandwidth remaining ratio 10`
	
	`class class-default`
	`bandwidth remaining ratio 15`

Egress BSSID policy	`policy-map bssid-policer`
	`queue-buffer ratio 0`
	`class class-default`
	`shape average 30000000`
	`set dscp dscp table dscp2dscp`
	`set wlan user-priority dscp table dscp2up`
	`service-policy ssid_child_qos`

SSID Child QoS policy	`Policy Map ssid-child_qos`
	`Class voice`
	`priority level 1`
	`police cir 5m`
	`admit cac wmm-tspec`
	`UP 6,7 / tells WCM allow 'voice'`
	`TSPEC\SIP snoop for this ssid`
	`rate 4000 / must be police rate`
	`value is in kbps)`
	`Class video`
	`priority level 2`
	`police cir 60000`

Related Topics

SSID Policies, on page 7

Examples: Client Policies

Type of Client Policy	Example/Details

Default egress client policy	Any incoming traffic contains the user-priority as 0.
	Note The default client policy is enabled only on WMM clients that are ACM-enabled.
	You can verify if ACM is enabled by using the **show ap dot11 5ghz network** command. To enable ACM, use the **ap dot11 5ghz cac voice acm** command.
	`Policy-map client-def-down`
	`class class-default`
	`set wlan user-priority 0`

Type of Client Policy	Example/Details

Default ingress client policy	Any traffic that is sent to the wired network from wireless network will result in the DSCP value being set to 0.
	Note The default client policy is enabled only on WMM clients that are ACM-enabled.
	`Policy-map client-def-up`
	`  class class-default`
	`  set dscp 0`

Client policies generated automatically and applied to the WMM client when the client authenticates to a profile in AAA with a configured QoS-level attribute.	`Policy Map platinum-WMM`
	`Class voice-plat`
	`  set wlan user-priority 6`
	`Class video-plat`
	`set wlan user-priority 4`
	`Class class-default`
	`  set wlan user-priority 0`
	
	`Policy Map gold-WMM`
	`Class voice-gold`
	`  set wlan user-priority 4`
	`Class video-gold`
	`set wlan user-priority 4`
	`Class class-default`
	`  set wlan user-priority 0`

Non-WMM client precious metal policies	`Policy Map platinum` `  set wlan user-priority 6`

Egress client policy where any traffic matching class voice1, the user priority is set to a pre-defined value.	The class can be set to assign a DSCP or ACL.
	`Policy Map client1-down`
	`Class voice1  //match dscp, cos`
	`  set wlan user-priority <>`
	`Class voice2  //match acl`
	`  set wlan user-priority <>`
	`Class voice3`
	`  set wlan user-priority <>`
	`Class class-default`
	`  set wlan user-priority 0`

Type of Client Policy	Example/Details

Client policy based on AAA and TCLAS	`Policy Map client2-down[ AAA+ TCLAS pol example]`
	`Class voice\\match dscp`
	`police <>`
	`set <>`
	`Class class-default`
	`set <>`
	`Class voice1|| voice2 [match acls]`
	`police <>`
	`class voice1`
	`set <>`
	`class voice2`
	`set <>`

Client policy for voice and video for traffic in the egress direction	`Policy Map client3-down`
	`class voice \\match dscp, cos`
	`police X`
	`class video`
	`police Y`
	`class class-default`
	`police Z`

Client policy for voice and video for traffic in the ingress direction using policing	`Policy Map client1-up`
	`class voice \\match dscp, up, cos`
	`police X`
	`class video`
	`police Y`
	`class class-default`
	`police Z`

Client policy for voice and video based on DSCP	`Policy Map client2-up`
	`class voice \\match dscp, up, cos`
	`set dscp <>`
	`class video`
	`set dscp <>`
	`class class-default`
	`set dscp <>`

Client ingress policy with marking and policing	`policy-map client_in_policy`
	`class dscp-48 //match dscp 48`
	`set cos 3`
	`police 2m`
	`class up-4 //match wlan user-priority 4`
	`set dscp 10`
	`police 3m`
	`class acl //match acl`
	`set cos 2`
	`police 5m`
	`class class-default`
	`set dscp 20`
	`police 15m`

Hierarchical client ingress policy	

Type of Client Policy	Example/Details
	policy-map client-child-policy class voice //match dscp 46 set dscp 40 police 5m class video //match dscp 34 set dscp 30 police 7m policy-map client-in-policy class class-default police 15m service-policy client-child-policy

Related Topics

Client Policies, on page 8

Additional References

Related Documents

Related Topic	Document Title
QoS Command Reference	*QoS Command Reference (Catalyst 3850 Switches)*
Mobility Configuration Guide	*Mobility Configuration Guide, Cisco IOS XE Release 3SE (Catalyst 3850 Switches)*
Quality of Service Solutions Configuration Guide (Cisco IOS Software)	*Quality of Service Solutions Configuration Guide Library, Cisco IOS XE Release 3SE (Cisco WLC 5700 Series)*

MIBs

MIB	MIBs Link
All supported MIBs for this release.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

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