



Configuring QoS

This chapter describes how to configure quality of service (QoS) on your access point. With this feature, you can provide preferential treatment to certain traffic at the expense of others. Without QoS, the access point offers best-effort service to each packet, regardless of the packet contents or size. It sends the packets without any assurance of reliability, delay bounds, or throughput.

This chapter consists of these sections:

- [Understanding QoS for Wireless LANs, page 9-2](#)
- [Configuring QoS, page 9-4](#)

Understanding QoS for Wireless LANs

Typically, networks operate on a best-effort delivery basis, which means that all traffic has equal priority and an equal chance of being delivered in a timely manner. When congestion occurs, all traffic has an equal chance of being dropped.

When you configure QoS on the access point, you can select specific network traffic, prioritize it, and use congestion-management and congestion-avoidance techniques to provide preferential treatment. Implementing QoS in your wireless LAN makes network performance more predictable and bandwidth utilization more effective.

When you configure QoS, you create QoS policies and apply the policies to the VLANs configured on your access point. If you do not use VLANs on your network, you can apply your QoS policies to the access point's Ethernet and radio ports.

**Note**

When you enable QoS, the access point uses Wi-Fi Multimedia (WMM) mode by default. See the [“Using Wi-Fi Multimedia Mode” section on page 9-4](#) for information on WMM.

QoS for Wireless LANs Versus QoS on Wired LANs

The QoS implementation for wireless LANs differs from QoS implementations on other Cisco devices. With QoS enabled, access points perform the following:

- They do not classify packets; they prioritize packets based on DSCP value, client type (such as a wireless phone), or the priority value in the 802.1q or 802.1p tag.
- They do not construct internal DSCP values; they only support mapping by assigning IP DSCP, Precedence, or Protocol values to Layer 2 COS values.
- They carry out EDCF like queuing on the radio egress port only.
- They do only FIFO queueing on the Ethernet egress port.
- They support only 802.1Q/P tagged packets. Access points do not support ISL.
- They support only MQC policy-map **set cos** action.
- They prioritize the traffic from voice clients (such as Symbol phones) over traffic from other clients when the QoS Element for Wireless Phones feature is enabled.
- They support Spectralink phones using the class-map IP protocol clause with the protocol value set to 119.

To contrast the wireless LAN QoS implementation with the QoS implementation on other Cisco network devices, see the *Cisco IOS Quality of Service Solutions Configuration Guide* at this URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/fqos_c/index.htm

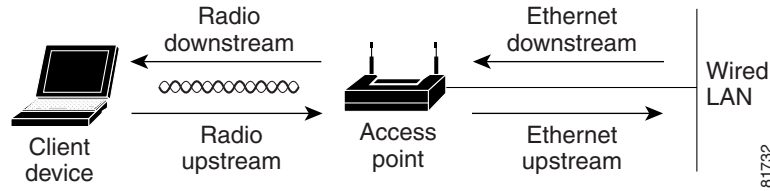
Impact of QoS on a Wireless LAN

Wireless LAN QoS features are a subset of the proposed 802.11e draft. QoS on wireless LANs provides prioritization of traffic from the access point over the WLAN based on traffic classification.

Just as in other media, you might not notice the effects of QoS on a lightly loaded wireless LAN. The benefits of QoS become more obvious as the load on the wireless LAN increases, keeping the latency, jitter, and loss for selected traffic types within an acceptable range.

QoS on the wireless LAN focuses on downstream prioritization from the access point. Figure 9-1 shows the upstream and downstream traffic flow.

Figure 9-1 Upstream and Downstream Traffic Flow



- The radio downstream flow is traffic transmitted out the access point radio to a wireless client device. This traffic is the main focus for QoS on a wireless LAN.
- The radio upstream flow is traffic transmitted out the wireless client device to the access point. QoS for wireless LANs does not affect this traffic.
- The Ethernet downstream flow is traffic sent from a switch or a router to the Ethernet port on the access point. If QoS is enabled on the switch or router, the switch or router might prioritize and rate-limit traffic to the access point.
- The Ethernet upstream flow is traffic sent from the access point Ethernet port to a switch or router on the wired LAN. The access point does not prioritize traffic that it sends to the wired LAN based on traffic classification.

Precedence of QoS Settings

When you enable QoS, the access point queues packets based on the Layer 2 class of service value for each packet. The access point applies QoS policies in this order:

1. **Packets already classified**—When the access point receives packets from a QoS-enabled switch or router that has already classified the packets with non-zero 802.1Q/P user_priority values, the access point uses that classification and does not apply other QoS policy rules to the packets. An existing classification takes precedence over all other policies on the access point.



Note Even if you have not configured a QoS policy, the access point always honors tagged 802.1P packets that it receives over the radio interface.

2. **QoS Element for Wireless Phones setting**—If you enable the *QoS Element for Wireless Phones* setting, dynamic voice classifiers are created for some of the wireless phone vendor clients, which allows the wireless phone traffic to be a higher priority than other clients' traffic. Additionally, the QoS Basic Service Set (QBSS) is enabled to advertise channel load information in the beacon and probe response frames. Some IP phones use QBSS elements to determine which access point to associate to, based on the traffic load.

You can use the Cisco IOS command **dot11 phone dot11e** command to enable the future upgrade of the 7920 Wireless Phone firmware to support the standard QBSS Load IE. The new 7920 Wireless Phone firmware will be announced at a later date.

**Note**

This release continues to support existing 7920 wireless phone firmware. Do not attempt to use the new standard (IEEE 802.11e draft 13) QBSS Load IE with the 7920 Wireless Phone until new phone firmware is available for you to upgrade your phones.

This example shows how to enable IEEE 802.11 phone support with the legacy QBSS Load element:

```
AP(config)# dot11 phone
```

This example shows how to enable IEEE 802.11 phone support with the standard (IEEE 802.11e draft 13) QBSS Load element:

```
AP(config)# no dot11 phone dot11e
```

This example shows how to stop or disable the IEEE 802.11 phone support:

```
AP(config)# no dot11 phone
```

3. Policies you create on the access point—QoS Policies that you create and apply to VLANs or to the access point interfaces are third in precedence after previously classified packets and the *QoS Element for Wireless Phones* setting.
4. Default classification for all packets on VLAN—If you set a default classification for all packets on a VLAN, that policy is fourth in the precedence list.

Using Wi-Fi Multimedia Mode

When you enable QoS, the access point uses Wi-Fi Multimedia (WMM) mode by default. WMM provides these enhancements over basic QoS mode:

- The access point adds each packet's class of service to the packet's 802.11 header to be passed to the receiving station.
- Each access class has its own 802.11 sequence number. The sequence number allows a high-priority packet to interrupt the retries of a lower-priority packet without overflowing the duplicate checking buffer on the receiving side.
- For access classes that are configured to allow it, transmitters that are qualified to transmit through the normal backoff procedure are allowed to send a set of pending packets during the configured transmit opportunity (a specific number of microseconds). Sending a set of pending packets improves throughput because each packet does not have to wait for a backoff to gain access; instead, the packets can be transmitted immediately one after the other.

The access point uses WMM enhancements in packets sent to client devices that support WMM. The access point applies basic QoS policies to packets sent to clients that do not support WMM.

Use the **no dot11 qos mode wmm** configuration interface command to disable WMM using the CLI. To disable WMM using the web-browser interface, unselect the check boxes for the radio interfaces on the QoS Advanced page.

Configuring QoS

QoS is disabled by default (however, the radio interface always honors tagged 802.1P packets even when you have not configured a QoS policy). This section describes how to configure QoS on your access point. It contains this configuration information:

- [Configuration Guidelines, page 9-5](#)
- [Adjusting Radio Access Categories, page 9-5](#)
- [Disabling IGMP Snooping Helper, page 9-6](#)

Configuration Guidelines

Before configuring QoS on your access point, you should be aware of this information:

- The most important guideline in QoS deployment is to be familiar with the traffic on your wireless LAN. If you know the applications used by wireless client devices, the applications' sensitivity to delay, and the amount of traffic associated with the applications, you can configure QoS to improve performance.
- QoS does not create additional bandwidth for your wireless LAN; it helps control the allocation of bandwidth. If you have plenty of bandwidth on your wireless LAN, you might not need to configure QoS.

Adjusting Radio Access Categories

The access point uses the radio access categories to calculate backoff times for each packet. As a rule, high-priority packets have short backoff times.

The default values in the Min and Max Contention Window fields and in the Slot Time fields are based on settings recommended in IEEE Draft Standard 802.11e. For detailed information on these values, consult that standard.

Cisco strongly recommends that you use the default settings on the Radio Access Categories page. Changing these values can lead to unexpected blockages of traffic on your wireless LAN, and the blockages might be difficult to diagnose. If you change these values and find that you need to reset them to defaults, use the default settings listed in [Table 9-1](#).

The values listed in [Table 9-1](#) are to the power of 2. The access point computes Contention Window values with this equation:

$$CW = 2 ** X \text{ minus } 1$$

where X is the value from [Table 9-1](#).

Table 9-1 **Default QoS Radio Access Categories**

Class of Service	Min Contention Window	Max Contention Window	Fixed Slot Time	Transmit Opportunity
Background	4	10	7	0
Best Effort	4	10	3	0
Video <100ms Latency	3	4	2	3008
Voice <100ms Latency	2	3	2	1504



Note

In this release, clients are blocked from using an access category when you select **Enable** for Admission Control.

Using the Admission Control check boxes, you can control client use of the access categories. When you enable admission control for an access category, clients associated to the access point must complete the WMM admission control procedure before they can use that access category. However, access points do not support the admission control procedure in this release, so clients cannot use the access category when you enable Admission Control.

Disabling IGMP Snooping Helper

When Internet Group Membership Protocol (IGMP) snooping is enabled on a switch and a client roams from one access point to another, the clients' multicast session is dropped. When the access points' IGMP snooping helper is enabled, the access point sends a general query to the wireless LAN, prompting the client to send in an IGMP membership report. When the network infrastructure receives the host's IGMP membership report, it ensures delivery of that host's multicast data stream.

The IGMP snooping helper is enabled by default. To disable it, browse to the QoS Policies - Advanced page, select **Disable**, and click **Apply**.

Sample Configuration Using the CLI

```
class-map match-all _class_WMM1
match ip precedence 1
class-map match-all _class_WMM0
match ip precedence 0
class-map match-all _class_WMM3
match ip precedence 3
class-map match-all _class_WMM2
match ip precedence 2
class-map match-all _class_WMM5
match ip precedence 5
class-map match-all _class_WMM4
match ip precedence 4
class-map match-all _class_WMM7
match ip precedence 7
class-map match-all _class_WMM6
match ip precedence 6
```

```
policy-map WMM
class _class_WMM0
set cos 0
class _class_WMM1
set cos 1
class _class_WMM2
set cos 2
class _class_WMM3
set cos 3
class _class_WMM4
set cos 4
class _class_WMM5
set cos 5
class _class_WMM6
set cos 6
class _class_WMM7
set cos 7
```