CHAPTER 12

Configuring QoS in a Wireless Environment

This chapter describes how to configure quality of service (QoS) on your Cisco wireless mobile interface card (WMIC). With this feature, you can provide preferential treatment to certain traffic at the expense of others. Without QoS, the WMIC 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

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 WMIC, 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 VLAN configured on your WMIC. If you do not use VLANs on your network, you can apply your QoS policies to the WMIC's Ethernet and radio ports.

Note When you enable QoS, the access point uses Wi-Fi Multimedia (WMM) mode by default.

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, bridges 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 match packets using ACL; they use only modular quality of service (MQC) class-map for matching clauses.

- They do not construct internal DSCP values; they only support mapping by assigning IP Differentiated Services Code Point (DSCP), Precedence, or Protocol values to Layer 2 COS values.
- They carry out Enhanced Distributed Coordination Function (EDCF)-like queuing on the radio egress port only.
- They do only FIFO queuing on the Ethernet egress port.
- They support only 802.1Q/P tagged packets. Bridges do not support InterSwitch Link Protocol (ISL).
- They support only MQC policy-map **set cos** action.

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 WMIC 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 WMIC. These are the effects of QoS on network traffic:

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

Precedence of QoS Settings

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

1. Packets already classified—When the WMIC 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 WMIC 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 WMIC.

Note   The WMIC always acts on tagged 802.1P packets that it receives over the radio interface, even if a QoS policy has not been configured.

2. Policies you create on the WMIC—QoS Policies that you create and apply to VLANs or to the WMIC interfaces are second in precedence after previously classified packets.

3. Default classification for all packets on VLAN—If you set a default classification for all packets on a VLAN, that policy is third in the precedence list.

Using Wi-Fi Multimedia Mode

When you enable QoS, the access point uses Wi-Fi Multimedia (WMM) mode by default.

The following features of the WMM specification are supported:

- Addition of the WMM information element to associate request frames
- Addition of the WMM parameter element to the beacon, probe response and association response frames
- Addition of the QoS control field to data frames
- Support for setting the field sent in the WMM parameter element (per access class):
  - contention window (CW) min
  - CW max
  - Aifs
  - Admission control required
  - Transmit opportunity (TXOP) size
- Separate transmit sequence numbers for each access class and for frames that do not have the QoS control field
- Separate duplicate sequence number checking lists on receive for each access class and for frames that do not have the QoS control field
- No ACK frames for QOS control fields that do not require ACK
- Negotiation of WMM capability with client on reassociation
- Support for burst transmission of multiple frames in a transmit opportunity
- Support for the WMM specified backoff procedure
- Support for the WMM retransmit procedure
- Addition of 802.1d priority for WMM enabled clients
- Support for separate Temporal Key Integrity Protocol (TKIP) replay detection counters on receive for each access class and for frames that do not have the QOS control field

The following features of the WMM specification are not supported:

- Transmission of a packet with the *no ACK required* bit set in the QoS control field
- End of service period (EOSP) bit in the QoS control field
- Management action frames
- TSPEC element
- Admission control procedure
- Enforcement of admission control required field
- Triggered power save delivery

Configuring QoS

QoS is disabled by default. This section describes how to configure QoS on your WMIC.

Before configuring QoS on your WMIC, 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.

QoS Configuration Examples

QoS Example Configuration for VLAN

The following example queues all traffic from VLAN100 to the voice queue:

```
interface fastEthernet 0.1
 encapsulation dot1Q 1 native
 bridge-group 1

interface fastEthernet 0.100
 encapsulation dot1Q 100
 bridge-group 100

interface fastEthernet 0.101
 encapsulation dot1Q 101
 bridge-group 101

interface dot11Radio 0.1
 encapsulation dot1Q 1 native
 bridge-group 1

interface dot11Radio 0.100
 encapsulation dot1Q 100
 bridge-group 100

interface dot11Radio 0.101
 encapsulation dot1Q 101
 bridge-group 101

interface dot11Radio 0
 ssid qosWMIC-1
  vlan 1
  authentication open
 ssid qosWMIC-100
  vlan 100
  authentication open
 ssid qosWMIC-101
  vlan 101
  authentication open

class-map match-all alldata
 match any
```

```
policy-map v100traffic
 class alldata
  set cos 6

interface dot11Radio 0.100
 service-policy output v100traffic
```

QoS Example of IP DSCP and IP Precedence

The following example queues traffic data with the IP Precedence value 2 to Queue 0, IP DSCP value 12 to Queue 1, IP Precedence value 5 to Queue 2, and IP DSCP value 46 to queue 3.

```
class-map match-all dscp12
 match ip dscp af12

class-map match-all dscp46
 match ip dscp ef

class-map match-all prec2
 match ip precedence immediate

class-map match-all prec5
 match ip precedence critical

policy-map L3Map
class prec2
  set cos 2
 class dscp12
  set cos 0
class prec5
  set cos 5
class dscp46
  set cos 6

interface dot11Radio 0
 service-policy output L3Map
```