Configuring Quality of Service

- Configuring Quality of Service, on page 1
- Configuring Quality of Service Roles, on page 5

Configuring Quality of Service

Quality of Service

Quality of service (QoS) refers to the capability of a network to provide better service to selected network traffic over various technologies. The primary goal of QoS is to provide priority including dedicated bandwidth, controlled jitter and latency (required by some real-time and interactive traffic), and improved loss characteristics.

The controller supports four QoS levels:

- Platinum/Voice—Ensures a high quality of service for voice over wireless.
- Gold/Video—Supports high-quality video applications.
- Silver/Best Effort—Supports normal bandwidth for clients. This is the default setting.
- Bronze/Background—Provides the lowest bandwidth for guest services.

Note VoIP clients should be set to Platinum.

You can configure the bandwidth of each QoS level using QoS profiles and then apply the profiles to WLANs. The profile settings are pushed to the clients associated to that WLAN. In addition, you can create QoS roles to specify different bandwidth levels for regular and guest users. Follow the instructions in this section to configure QoS profiles and QoS roles. You can also define the maximum and default QoS levels for unicast and multicast traffic when you assign a QoS profile to a WLAN.

The wireless rate limits can be defined on both upstream and downstream traffic. Rate limits can be defined per SSID and/or specified as a maximum rate limit for all clients. These rate limits can be individually configured.

This section contains the following subsections:

Configuring Quality of Service Profiles

You can configure the Platinum, Gold, Silver, and Bronze QoS profiles.

Configuring QoS Profiles (GUI)

Step 1 Disable the 802.11a and 802.11b/g networks so that you can configure the QoS profiles.

To disable the radio networks, choose **Wireless > 802.11a/n/ac** or **802.11b/g/n > Network**, unselect the **802.11a** (or **802.11b/g**) **Network Status** check box, and click **Apply**.

Step 2 Choose **Wireless > QoS > Profiles** to open the **QoS Profiles** page.

Step 3 Click the name of the profile that you want to configure to open the Edit QoS Profile page.

Step 4 Change the description of the profile by modifying the contents of the Description text box.

Step 5 Define the data rates on a per-user basis as follows:

a) Define the average data rate for TCP traffic per user by entering the rate in Kbps in the Average Data Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

b) Define the peak data rate for TCP traffic per user by entering the rate in Kbps in the Burst Data Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

Note The burst data rate should be greater than or equal to the average data rate. Otherwise, the QoS policy may block traffic to and from the wireless client.

Ensure that you configure the average data rate before you configure the burst data rate.

c) Define the average real-time rate for UDP traffic per user by entering the rate in Kbps in the Average Real-Time Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

Note Average Data Rate is used to measure TCP traffic while Average Real-time rate is used for UDP traffic. They are measured in kbps for all the entries. The values for Average Data Rate and Average Real-time rate can be different because they are applied to different upper layer protocols such as TCP and UDP. These different values for the rates do not impact the bandwidth.

d) Define the peak real-time rate for UDP traffic per user by entering the rate in Kbps in the Burst Real-Time Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

Note The burst real-time rate should be greater than or equal to the average real-time rate. Otherwise, the QoS policy may block traffic to and from the wireless client.

Step 6 Define the data rates on a per-SSID basis as follows:

a) Define the average data rate TCP traffic per SSID by entering the rate in Kbps in the Average Data Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

b) Define the peak data rate for TCP traffic per SSID by entering the rate in Kbps in the Burst Data Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

Note The burst data rate should be greater than or equal to the average data rate. Otherwise, the QoS policy may block traffic in the WLANs.

c) Define the average real-time rate for UDP traffic per SSID by entering the rate in Kbps in the Average Real-Time Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

d) Define the peak real-time rate for UDP traffic per SSID by entering the rate in Kbps in the Burst Real-Time Rate text boxes. A value of 0 indicates that the value specified in the selected QoS profile will take effect.

Note The burst real-time rate should be greater than or equal to the average real-time rate. Otherwise, the QoS policy may block traffic in the WLANs.

Step 7 Define the maximum and default QoS levels for unicast and multicast traffic when you assign a QoS profile to a WLAN.

a) From the Maximum Priority drop-down list, choose the maximum QoS priority for any data frames transmitted by the AP to any station in the WLAN.

For example, a QoS profile named 'gold' targeted for video applications has the maximum priority set to video by default.

b) From the Unicast Default Priority drop-down list, choose the QoS priority for unicast data frames transmitted by the AP to non-WMM stations in the WLAN

c) From the Multicast Default Priority drop-down list, choose the QoS priority for multicast data frames transmitted by the AP to stations in the WLAN,

Note The default unicast priority cannot be used for non-WMM clients in a mixed WLAN.

Step 8 Choose **802.1p** from the Protocol Type drop-down list and enter the maximum priority value in the 802.1p Tag text box to define the maximum value (0–7) for the priority tag associated with packets that fall within the profile.

The tagged packets include CAPWAP data packets (between access points and the controller) and packets sent toward the core network.

Note If a QoS profile has 802.1p tagging configured and if this QoS profile is assigned to a WLAN that uses an untagged interface on the controller, the client traffic will be blocked.

Step 9 Click **Apply**.

Step 10 Click **Save Configuration**.

Step 11 Reenable the 802.11 networks.

To enable the radio networks, choose **Wireless > 802.11a/n/ac** or **802.11b/g/n > Network**, select the **802.11a** (or **802.11b/g**) **Network Status** check box, and click **Apply**.

Step 12 Choose **WLANs** and select a WLAN ID to apply the new QoS profile to it.

Step 13 In the **WLAN > Edit** page, go to the **QoS** tab and select the QoS Profile type from the Quality of Service drop-down list. The QoS profile will add the rate limit values configured on the controller on per WLAN, per radio and per AP basis.

For example, if upstream rate limit of 5Mbps is configured for a QoS profile of type silver, then every WLAN that has silver profile will limit traffic to 5Mbps (5Mbps for each wlan) on each radio and on each AP where the WLAN is applicable.

Step 14 Click **Apply**.

Step 15 Click **Save Configuration**.

Configuring QoS Profiles (CLI)

Step 1 Disable the 802.11a and 802.11b/g networks so that you can configure the QoS profiles by entering these commands:

config 802.11{a | b} disable network

Step 2 Change the profile description by entering this command:

config qos description {**bronze** | **silver** | **gold** | **platinum** }*description*

Step 3 Define the average data rate for TCP traffic per user or per SSID by entering this command:

config qos average-data-rate {**bronze** | **silver** | **gold** | **platinum**} {**per-ssid** | **per-client**} {**downstream** | **upstream**} *rate*

Note For the *rate* parameter, you can enter a value between 0 and 512,000 Kbps (inclusive). A value of 0 imposes no bandwidth restriction on the QoS profile.

Step 4 Define the peak data rate for TCP traffic per user or per SSID by entering this command:

config qos burst-data-rate {**bronze** | **silver** | **gold** | **platinum**} {**per-ssid** | **per-client**} {**downstream** | **upstream**} *rate*

Step 5 Define the average real-time data rate for UDP traffic per user or per SSID by entering this command:

config qos average-realtime-rate {**bronze** | **silver** | **gold** | **platinum**} {**per-ssid** | **per-client**} {**downstream** | **upstream**} *rate*

Step 6 Define the peak real-time data rate for UDP traffic per user or per SSID by entering this command:

config qos burst-realtime-rate {**bronze** | **silver** | **gold** | **platinum**} {**per-ssid** | **per-client**} {**downstream** | **upstream**} *rate*

Step 7 Define the maximum and default QoS levels for unicast and multicast traffic when you assign a QoS profile to a WLAN by entering this command:

config qos priority {**bronze** | **gold** | **platinum** | **silver**} {*maximum priority*} {*default unicast priority*} {*default multicast priority*}

You choose from the following options for the *maximum priority*, *default unicast priority*, and *default multicast priority* parameters:

- besteffort
- background
- video
- voice

Step 8 Define the maximum value (0–7) for the priority tag associated with packets that fall within the profile, by entering these commands:

config qos protocol-type {**bronze** | **silver** | **gold** | **platinum**} **dot1p**

config qos dot1p-tag {**bronze** | **silver** | **gold** | **platinum**} *tag*

The tagged packets include CAPWAP data packets (between access points and the controller) and packets sent toward the core network.

Note The 802.1p tagging has impact only on wired packets. Wireless packets are impacted only by the maximum priority level set for a QoS profile.

Note If a QoS profile has 802.1p tagging configured and if this QoS profile is assigned to a WLAN that uses an untagged interface on the controller, the client traffic will be blocked.

Step 9 Reenable the 802.11a and 802.11b/g networks so that you can configure the QoS profiles by entering these commands:

config 802.11{a | b} enable network

Step 10 Apply the new QoS profile to a WLAN, by entering these commands:
config wlan qos <WLAN ID> {bronze | silver | gold | platinum}

Configuring Quality of Service Roles

Quality of Service Roles

After you configure a QoS profile and apply it to a WLAN, it limits the bandwidth level of clients associated to that WLAN. Multiple WLANs can be mapped to the same QoS profile, which can result in bandwidth contention between regular users (such as employees) and guest users. In order to prevent guest users from using the same level of bandwidth as regular users, you can create QoS roles with different (and presumably lower) bandwidth contracts and assign them to guest users.

You can configure up to ten QoS roles for guest users.

Note If you choose to create an entry on the RADIUS server for a guest user and enable RADIUS authentication for the WLAN on which web authentication is performed rather than adding a guest user to the local user database from the controller, you need to assign the QoS role on the RADIUS server itself. To do so, a "guest-role" Airespace attribute called the *Airespace-Guest-Role-Name* with the attribute identifier value of 11 and the datatype of string, which should match the name of the "guest-role" configured on the controller, needs to be added on the RADIUS server. This attribute is sent to the controller when authentication occurs. If a role with the name returned from the RADIUS server is found configured on the controller, the bandwidth associated with that role is enforced for the guest user after authentication completes successfully.

Ensure that the Layer 3 security of *Web Policy* is configured on the WLAN before the AAA parameter is processed by the controller. If the WLAN does not have a Layer 3 Security of *Web Policy*, the AAA parameter is ignored.

This section contains the following subsections:

Configuring QoS Roles

Configuring QoS Roles (GUI)

Step 1 Choose **Wireless** > **QoS** > **Roles** to open the QoS Roles for the Guest Users page.

This page shows any existing QoS roles for guest users.

Note If you want to delete a QoS role, hover your cursor over the blue drop-down arrow for that role and choose **Remove**.

Step 2 Click **New** to create a new QoS role. The **QoS Role Name > New** page appears.

Step 3 In the **Role Name** text box, enter a name for the new QoS role. The name should uniquely identify the role of the QoS user (such as Contractor, Vendor, and so on).

Step 4 Click **Apply**.

Step 5 Click the name of the QoS role to edit the bandwidth of a QoS role. The **Edit QoS Role Data Rates** page appears.

Note The values that you configure for the per-user bandwidth contracts affect only the amount of bandwidth going downstream (from the access point to the wireless client). They do not affect the bandwidth for upstream traffic (from the client to the access point).

Note The Access Points that support per-user bandwidth contracts for upstream (from the client to the access point) are - AP1140, AP1040, AP3500, AP3600, AP1250, and AP1260.

Step 6 Define the average data rate for TCP traffic on a per-user basis by entering the rate in Kbps in the **Average Data Rate** text box. You can enter a value between 0 and 60,000 Kbps (inclusive). A value of 0 imposes no bandwidth restriction on the QoS role.

Step 7 Define the peak data rate for TCP traffic on a per-user basis by entering the rate in Kbps in the Burst Data Rate text box. You can enter a value between 0 and 60,000 Kbps (inclusive). A value of 0 imposes no bandwidth restriction on the QoS role.

Note The burst data rate should be greater than or equal to the average data rate. Otherwise, the QoS policy may block traffic to and from the wireless client.

Ensure that you configure the average data rate before you configure the burst data rate.

Step 8 Define the average real-time rate for UDP traffic on a per-user basis by entering the rate in Kbps in the **Average Real-Time Rate** text box. You can enter a value between 0 and 60,000 Kbps (inclusive). A value of 0 imposes no bandwidth restriction on the QoS role.

Step 9 Define the peak real-time rate for UDP traffic on a per-user basis by entering the rate in Kbps in the **Burst Real-Time Rate** text box. You can enter a value between 0 and 60,000 Kbps (inclusive). A value of 0 imposes no bandwidth restriction on the QoS role.

Note The burst real-time rate should be greater than or equal to the average real-time rate. Otherwise, the QoS policy may block traffic to and from the wireless client.

Step 10 Click **Apply**.

Step 11 Click **Save Configuration**.

Step 12 Apply a QoS role to a guest user by following the instructions in the Configuring Local Network Users for the Controller (GUI) section.

Configuring QoS Roles (CLI)

Step 1 Create a QoS role for a guest user by entering this command:

config netuser guest-role create *role_name*

Note If you want to delete a QoS role, enter the **config netuser guest-role delete** *role_name* command.

Step 2 Configure the bandwidth contracts for a QoS role by entering these commands:

- **config netuser guest-role qos data-rate average-data-rate** *role_name rate*—Configures the average data rate for TCP traffic on a per-user basis.
- **config netuser guest-role qos data-rate burst-data-rate** *role_name rate*—Configures the peak data rate for TCP traffic on a per-user basis.

  Note The burst data rate should be greater than or equal to the average data rate. Otherwise, the QoS policy may block traffic to and from the wireless client.

- **config netuser guest-role qos data-rate average-realtime-rate** *role_name rate*—Configures the average real-time rate for UDP traffic on a per-user basis.
- **config netuser guest-role qos data-rate burst-realtime-rate** *role_name rate*—Configures the peak real-time rate for UDP traffic on a per-user basis.

  Note The burst real-time rate should be greater than or equal to the average real-time rate. Otherwise, the QoS policy may block traffic to and from the wireless client.

  Note For the *role_name* parameter in each of these commands, enter a name for the new QoS role. The name should uniquely identify the role of the QoS user (such as Contractor, Vendor, and so on). For the *rate* parameter, you can enter a value between 0 and 60,000 Kbps (inclusive). A value of 0 imposes no bandwidth restriction on the QoS role.

Step 3 Apply a QoS role to a guest user by entering this command:

config netuser guest-role apply *username role_name*

For example, the role of *Contractor* could be applied to guest user *jsmith*.

Note If you do not assign a QoS role to a guest user, the Role text box in the User Details shows the role as "default." The bandwidth contracts for this user are defined in the QoS profile for the WLAN.

Note If you want to unassign a QoS role from a guest user, enter the **config netuser guest-role apply** *username* **default command**. This user now uses the bandwidth contracts defined in the QoS profile for the WLAN.

Step 4 Save your changes by entering this command:

save config

Step 5 See a list of the current QoS roles and their bandwidth parameters by entering this command:

show netuser guest-roles

Information similar to the following appears:

```
Role Name..................................... Contractor
     Average Data Rate........................ 10
     Burst Data Rate.......................... 10
     Average Realtime Rate.................... 100
     Burst Realtime Rate...................... 100

Role Name..................................... Vendor
     Average Data Rate........................ unconfigured
     Burst Data Rate.......................... unconfigured
```

```
Average Realtime Rate..................... unconfigured
Burst Realtime Rate..................... unconfigured
```