Configuring 802.11 Bands

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Configuring 802.11 Bands

802.11 Bands

You can configure the 802.11b/g/n (2.4 GHz) and 802.11a/n (5 GHz) bands for the controller to comply with the regulatory requirements in your country. By default, both 802.11b/g/n and 802.11a/n are enabled.

This section contains the following subsections:

Configuring the 802.11 Bands (GUI)

Step 1 Choose **Wireless** > **802.11a/n** or **802.11b/g/n** > **Network** to open the **Global Parameters** page.

Step 2 Select the **802.11a** (or **802.11b/g**) **Network Status** check box to enable the 802.11a or 802.11b/g band. To disable the band, unselect the check box. The default value is enabled. You can enable both the 802.11a and 802.11b/g bands.

Step 3 If you enabled the 802.11b/g band in *Step 2*, select the **802.11g Support** check box if you want to enable 802.11g network support. The default value is enabled. If you disable this feature, the 802.11b band is enabled without 802.11g support.

Step 4 Specify the period at which the SSID is broadcast by the access point by entering a value between 20 and 1000 milliseconds (inclusive) in the Beacon Period text box. The default and the recommended value is 100 milliseconds.

Note The beacon period in controllers is listed in terms of milliseconds. The beacon period can also be measured in time units, where one time unit equals 1024 microseconds or 102.4 milliseconds. If a beacon interval is listed as 100 milliseconds in a controller, it is only a rounded off value for 102.4 milliseconds. Due to hardware limitation in certain radios, even though the beacon interval is, say 100 time units, it is adjusted to 102 time units, which roughly equals 104.448 milliseconds. When the beacon period is to be represented in terms of time units, the value is adjusted to the nearest multiple of 17.

Step 5 Specify the size at which packets are fragmented by entering a value between 256 and 2346 bytes (inclusive) in the Fragmentation Threshold text box. Enter a low number for areas where communication is poor or where there is a great deal of radio interference.

Step 6 Make access points advertise their channel and transmit power level in beacons and probe responses for CCX clients. Select the **DTPC Support** check box. Otherwise, unselect this check box. The default value is enabled.

Client devices using dynamic transmit power control (DTPC) receive the channel and power level information from the access points and adjust their settings automatically. For example, a client device used primarily in Japan could rely on DTPC to adjust its channel and power settings automatically when it travels to Italy and joins a network there.

Note DTPC and 801.11h power constraint cannot be enabled simultaneously.

Step 7 Specify the maximum number of allowed clients per radio within this band by entering a value between 1 to 200 in the **Maximum Allowed Client** box. The default value is 200.

Step 8 Use the Data Rates options to specify the rates at which data can be transmitted between the access point and the client. These data rates are available:

- 802.11a—6, 9, 12, 18, 24, 36, 48, and 54 Mbps
- 802.11b/g—1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps

For each data rate, choose one of these options:

- **Mandatory**—Clients must support this data rate in order to associate to an access point on the controller. At least one data rate must be mandatory.
- **Supported**—Any associated clients that support this data rate may communicate with the access point using that rate. However, the clients are not required to be able to use this rate in order to associate.
- **Disabled**—This data rate is not used for communication with associated clients.

Step 9 Click **Apply**.

Step 10 Click **Save Configuration**.

Configuring the 802.11 Bands (CLI)

Step 1 Disable the 802.11a band by entering this command:

config 802.11a disable network

Note The 802.11a band must be disabled before you can configure the 802.11a network parameters in this section.

Step 2 Disable the 802.11b/g band by entering this command:

config 802.11b disable network

Note The 802.11b band must be disabled before you can configure the 802.11b network parameters in this section.

Step 3 Specify the rate at which the SSID is broadcast by the access point by entering this command:

config {**802.11a** | **802.11b**} **beaconperiod** *time_unit*

where *time_unit* is the beacon interval in time units (TUs). One TU is 1024 microseconds. You can configure the access point to send a beacon every 20 to 1000 milliseconds.

Step 4 Specify the size at which packets are fragmented by entering this command:

config {**802.11a** | **802.11b**} **fragmentation** *threshold*

where *threshold* is a value between 256 and 2346 bytes (inclusive). Specify a low number for areas where communication is poor or where there is a great deal of radio interference.

Step 5 Make access points advertise their channel and transmit power level in beacons and probe responses by entering this command:

config {**802.11a** | **802.11b** } **dtpc** {**enable** | **disable**}

The default value is enabled. Client devices using dynamic transmit power control (DTPC) receive the channel and power level information from the access points and adjust their settings automatically. For example, a client device used primarily in Japan could rely on DTPC to adjust its channel and power settings automatically when it travels to Italy and joins a network there.

Note On access points that run Cisco IOS software, this feature is called *world mode*.

Step 6 Specify the maximum allowed clients that can be configured by entering this command:

config {**802.11a** | **802.11b**} **max-clients** *max_allow_clients*

The valid range is between 1 to 200.

Step 7 Specify the rates at which data can be transmitted between the controller and the client by entering this command:

config {**802.11a** | **802.11b**} **rate** {**disabled** | **mandatory** | **supported**} *rate*

where

- **disabled**—Clients specify the data rates used for communication.
- **mandatory**—Clients support this data rate in order to associate to an access point on the controller.
- **supported**—Any associated clients that support this data rate may communicate with the access point using that rate. However, the clients are not required to be able to use this rate in order to associate.
- *rate*—The rate at which data is transmitted:
  - 6, 9, 12, 18, 24, 36, 48, and 54 Mbps (802.11a)
  - 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps (802.11b/g)

Step 8 Enable the 802.11a band by entering this command:

config 802.11a enable network

The default value is enabled.

Step 9 Enable the 802.11b band by entering this command:

config 802.11b enable network

The default value is enabled.

Step 10 Enable or disable 802.11g network support by entering this command:

config 802.11b 11gSupport {**enable** | **disable**}

The default value is enabled. You can use this command only if the 802.11b band is enabled. If you disable this feature, the 802.11b band is enabled without 802.11g support.

Step 11 Enter the **save config** command to save your changes.

Step 12 View the configuration settings for the 802.11a or 802.11b/g band by entering this command:

show {**802.11a** | **802.11b**}

Information similar to the following appears:

```
802.11a Network.............................. Enabled
11nSupport................................... Enabled
      802.11a Low Band.......................... Enabled
      802.11a Mid Band.......................... Enabled
      802.11a High Band......................... Enabled
802.11a Operational Rates
    802.11a 6M Rate............................. Mandatory
    802.11a 9M Rate............................. Supported
    802.11a 12M Rate............................ Mandatory
    802.11a 18M Rate............................ Supported
    802.11a 24M Rate............................ Mandatory
    802.11a 36M Rate............................ Supported
    802.11a 48M Rate............................ Supported
    802.11a 54M Rate............................ Supported
...
Beacon Interval.............................. 100
...
Default Channel.............................. 36
Default Tx Power Level....................... 1
DTPC Status.................................. Enabled
Fragmentation Threshold...................... 2346
Maximum Number of Clients per AP............. 200
```

Configuring Band Selection

Band Select

Band select enables client radios that are capable of dual-band (2.4 and 5-GHz) operations to move to a less congested 5-GHz access point. The 2.4-GHz band is often congested. Clients on this band typically experience interference from Bluetooth devices, microwave ovens, and cordless phones as well as co-channel interference from other access points because of the 802.11b/g limit of 3 nonoverlapping channels. To prevent these sources of interference and improve overall network performance, configure band selection on the controller.

Band select works by regulating probe responses to clients and it can be enabled on a per-WLAN basis. It makes 5-GHz channels more attractive to clients by delaying probe responses to clients on 2.4-GHz channels. In an access point, the band select table can be viewed by running the **show dot11 band-select** command. It can also be viewed by running the **show cont d0/d1 | begin Lru** command.

Band Select Algorithm

The band select algorithm affects clients that use 2.4-GHz band. Initially, when a client sends a probe request to an access point, the corresponding client probe's Active and Count values (as seen from the band select table) become 1. The algorithm functions based on the following scenarios:

- Scenario1: Client RSSI (as seen from the **show cont d0/d1** | **begin RSSI**command output) is greater than both Mid RSSI and Acceptable Client RSSI.
  - Dual-band clients: No 2.4-GHz probe responses are seen at any time; 5-GHz probe responses are seen for all 5-GHz probe requests.
  - Single-band (2.4-GHz) clients: 2.4-GHz probe responses are seen only after the probe suppression cycle.
  - After the client's probe count reaches the configured probe cycle count, the algorithm waits for the Age Out Suppression time and then marks the client probe's Active value as 0. Then, the algorithm is restarted.
- Scenario2: Client RSSI (as seen from **show cont d0/d1** | **begin RSSI**) lies between Mid-RSSI and Acceptable Client RSSI.
  - All 2.4-GHz and 5-GHz probe requests are responded to without any restrictions.
  - This scenario is similar to the band select disabled.

Note The client RSSI value (as seen in the **sh cont d0** | **begin RSSI** command output) is the average of the client packets received, and the Mid RSSI feature is the instantaneous RSSI value of the probe packets. As a result, the client RSSI is seen as weaker than the configured Mid RSSI value (7-dB delta). The 802.11b probes from the client are suppressed to push the client to associate with the 802.11a band.

Restrictions for Band Selection

- Band selection-enabled WLANs do not support time-sensitive applications such as voice and video because of roaming delays.
- Mid-RSSI is unsupported on Cisco Aironet 1600 Series APs.
- Band selection is unsupported on Cisco Aironet 1040, OEAP 600 Series APs.
- Band selection is unsupported on Cisco Aironet 1040, OEAP 600 Series APs.
- Band selection operates only on access points that are connected to a controller. A FlexConnect access point without a controller connection does not perform band selection after a reboot.
- The band-selection algorithm directs dual-band clients only from the 2.4-GHz radio to the 5-GHz radio of the same access point, and it only runs on an access point when both the 2.4-GHz and 5-GHz radios are up and running.
- You can enable both band selection and aggressive load balancing on the controller. They run independently and do not impact one another.
- It is not possible to enable or disable band selection and client load balancing globally through the controller GUI or CLI. You can, however, enable or disable band selection and client load balancing for a particular WLAN.
- We recommend that you do not use Band Select in high-density areas such as stadiums.

Configuring Band Selection

Configuring Band Selection (GUI)

Step 1 Choose **Wireless** > **Advanced > Band Select** to open the **Band Select** page.

Step 2 In the **Probe Cycle Count** text box, enter a value between 1 and 10. This cycle count sets the number of 2.4 GHz probe suppression cycles. The cycle count sets the number of suppression cycles for a new client. The default cycle count is 2.

Step 3 In the **Scan Cycle Period Threshold (milliseconds)** text box, enter a value between 1 and 1000 milliseconds for the scan cycle period threshold. This setting determines the time threshold during which new probe requests from a client come from a new scanning cycle (i.e. only if the time difference between the successive probe requests is greater than this configured value, then the count value in the band select table increases). The default cycle threshold is 200 milliseconds.

Step 4 In the **Age Out Suppression (seconds)** text box, enter a value between 10 and 200 seconds. Age-out suppression sets the expiration time for pruning previously known 802.11b/g/n clients. The default value is 20 seconds. After this time elapses, clients become new and are subject to probe response suppression.

Step 5 In the **Age Out Dual Band (seconds)** text box, enter a value between 10 and 300 seconds. The age-out period sets the expiration time for pruning previously known dual-band clients. The default value is 60 seconds. After this time elapses, clients become new and are subject to probe response suppression.

Step 6 In the **Acceptable Client RSSI (dBm)** text box, enter a value between –20 and –90 dBm. This parameter sets the minimum RSSI for a client to respond to a probe. The default value is –80 dBm.

Step 7 In the **Acceptable Client Mid RSSI (dBm)** text box, enter a value between –20 and –90 dBm. This parameter sets the mid-RSSI, whose value can be used for toggling 2.4 GHz probe suppression based on the RSSI value. The default value is –60 dBm.

Step 8 Click **Apply**.

Step 9 Click **Save Configuration**.

Step 10 To enable or disable band selection on specific WLANs, choose **WLANs** > **WLAN ID**. The **WLANs > Edit** page appears.

Step 11 Click the **Advanced** tab.

Step 12 In the **Load Balancing and Band Select** text area, if you want to enable band selection, select the **Client Band Select** check box. If you want to disable band selection, leave the check box unselected. The default value is disabled.

Step 13 Click **Save Configuration**.

Configuring Band Selection (CLI)

Step 1 Set the probe cycle count for band select by entering this command:

config band-select cycle-count *cycle_count*

You can enter a value between 1 and 10 for the *cycle_count* parameter.

Step 2 Set the time threshold for a new scanning cycle period by entering this command:

config band-select cycle-threshold *milliseconds*

You can enter a value for threshold between 1 and 1000 for the *milliseconds* parameter.

Step 3 Set the suppression expire to the band select by entering this command:

config band-select expire suppression *seconds*

You can enter a value for suppression between 10 to 200 for the *seconds* parameter.

Step 4 Set the dual band expire by entering this command:

config band-select expire dual-band *seconds*

You can enter a value for dual band between 10 and 300 for the *seconds* parameter.

Step 5 Set the client RSSI threshold by entering this command:

config band-select client-rssi *client_rssi*

You can enter a value for minimum dBm of a client RSSI to respond to a probe between -20 and -90 for the *client_rssi* parameter.

Step 6 Set the client mid RSSI threshold by entering this command:

config band-select client-mid-rssi *client_mid_rssi*

You can enter a value for mid RSSI between -20 and -90 for the *client_mid_rssi* parameter.

Step 7 Enter the **save config** command to save your changes.

Step 8 Enable or disable band selection on specific WLANs by entering this command:

config wlan band-select allow {**enable** | **disable**} *wlan_ID*

You can enter a value between 1 and 512 for *wlan_ID* parameter.

Step 9 Verify your settings by entering this command:

show band-select

Information similar to the following appears:

```
Band Select Probe Response..................... Enabled
   Cycle Count................................. 3 cycles
   Cycle Threshold............................. 300 milliseconds
   Age Out Suppression......................... 20 seconds
   Age Out Dual Band........................... 20 seconds
   Client RSSI................................. -30 dBm
   Client Mid RSSI............................. -80 dBm
```

Step 10 Enter the **save config** command to save your changes.