Advanced Wireless Tuning

Band Selection

Information About Configuring Band Selection

Band selection enables client radios that are capable of dual-band (2.4- and 5-GHz) operation 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 three nonoverlapping channels. To prevent these sources of interference and improve overall network performance, you can configure band selection on the controller.

Band selection 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 the access point, the band select table can be viewed by giving show dot11 band-select command. It can also be viewed from show cont d0/d1 | begin Lru.

Note The WMM default configuration will not be shown in **show running-config** output.

Band Selection Algorithm

The band selection algorithm affects clients that use 2.4-GHz band. Initially, when a client sends a probe request to the 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:

- Scenario - 1: Client RSSI (as seen from **show cont d0/d1** | **begin RSSI**) 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.

- Scenario - 2: 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 without any restrictions.
  - This scenario is similar to the band select disabled.

Note The client RSSI value (seen as **sh cont d0** | **begin RSSI**) 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 on Band Selection

- Band-selection enabled WLANs do not support time-sensitive applications like voice and video because of roaming delays.
- Band selection can be used only with Cisco Aironet 1140, 1250, 1260, 1530, 1550, 1570, 1600, 1700, 1800, 2600, 2700, 2800, 3500, 3600, 3700, 3800 series access points.
- Mid RSSI is not supported on Cisco Aironet 1600 Series access points.
- Band selection is not supported in Cisco Aironet 1040, OEAP 600 series access points.
- 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. Band selection and client load balancing are enabled globally by default.

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.

Short and Long Preambles

Information About SpectraLink NetLink Telephones

For the best integration with the Cisco UWN solution, SpectraLink NetLink Telephones require an extra operating system configuration step: **enable long preambles**. The radio preamble (sometimes called a header) is a section of data at the head of a packet that contains information that wireless devices need when sending and receiving packets. Short preambles improve throughput performance, so they are enabled by default. However, some wireless devices, such as SpectraLink NetLink phones, require long preambles.

Configuring SpectraLink NetLink Phones

Enabling Long Preambles (GUI)

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

Step 2 If the **Short Preamble** check box is selected, continue with this procedure. However, if the Short Preamble check box is unselected (which means that long preambles are enabled), the controller is already optimized for SpectraLink NetLink phones and you do not need to continue this procedure.

Step 3 Unselect the **Short Preamble** check box to enable long preambles.

Step 4 Click **Apply** to update the controller configuration.

Note If you do not already have an active CLI session to the controller, we recommend that you start a CLI session to reboot the controller and watch the reboot process. A CLI session is also useful because the GUI loses its connection when the controller reboots.

Step 5 Choose **Commands** > **Reboot** > **Reboot > Save and Reboot to reboot the controller**. Click OK in response to this prompt:

```
Configuration will be saved and the controller will be rebooted. Click ok to confirm.
```

The controller reboots.

Step 6 Log back onto the controller GUI to verify that the controller is properly configured.

Step 7 Choose **Wireless** > **802.11b/g/n** > **Network** to open the 802.11b/g Global Parameters page. If the **Short Preamble** check box is unselected, the controller is optimized for SpectraLink NetLink phones.

Enabling Long Preambles (CLI)

Step 1 Log on to the controller CLI.

Step 2 Enter the show 802.11b command and select the Short preamble mandatory parameter. If the parameter indicates that short preambles are enabled, continue with this procedure. This example shows that short preambles are enabled:

```
Short Preamble mandatory..................... Enabled
```

However, if the parameter shows that short preambles are disabled (which means that long preambles are enabled), the controller is already optimized for SpectraLink NetLink phones and you do not need to continue this procedure.

Step 3 Disable the 802.11b/g network by entering this command:
config 802.11b disable *network*

You cannot enable long preambles on the 802.11a network.

Step 4 Enable long preambles by entering this command:
config 802.11b preamble *long*

Step 5 Reenable the 802.11b/g network by entering this command:
config 802.11b *enable network*

Step 6 Enter the reset system command to reboot the controller. Enter y when the prompt to save the system changes is displayed. The controller reboots.

Step 7 Verify that the controller is properly configured by logging back into the CLI and entering the show 802.11b command to view these parameters:

```
802.11b Network.............................. Enabled
Short Preamble mandatory..................... Disabled
```

These parameters show that the 802.11b/g network is enabled and that short preambles are disabled.

Configuring Enhanced Distributed Channel Access (CLI)

To configure 802.11 enhanced distributed channel access (EDCA) parameters to support SpectraLink phones, use the following CLI commands:

config advanced edca-parameter {**custom-voice** | **optimized-video-voice** | **optimized-voice** | **svp-voice** | **wmm-default**}

where

- **custom-voice** enables custom voice EDCA parameters
- **optimized-video-voice** enables combined video-voice-optimized parameters
- **optimized-voice** enables non-SpectraLink voice-optimized parameters
- **svp-voice** enables SpectraLink voice priority (SVP) parameters
- **wmm-default** enables wireless multimedia (WMM) default parameters

Note To propagate this command to all access points connected to the controller, make sure to disable and then reenable the 802.11b/g network after entering this command.

Receiver Start of Packet Detection Threshold (Rx-SOP)

Information About Receiver Start of Packet Detection Threshold

Receiver Start of Packet Detection Threshold (RxSOP) determines the Wi-Fi signal level in dBm at which an access point's radio demodulates and decodes a packet. As the Wi-Fi level increases, the radio sensitivity decreases and the receiver cell size becomes smaller. Reduction of the cell size affects the distribution of clients in the network.

RxSOP is used to address clients with weak RF links, sticky clients, and client load balancing across access points. RxSOP helps to optimize the network performance at high-density deployments such as stadiums and auditoriums where access points need to optimize the nearest and strongest clients.

Note RxSOP configuration is not applicable to the third radio module pluggable on a 3600 AP.

Restrictions for RxSOP

- RxSOP configurations are supported only on Cisco Aironet 1600, 2600, 2700, 2800, 3500, 3600, 1550, 3700, and 3800 series access points.
- The permitted range for the RxSOP threshold for the 5-GHz band is -76 dBm to -80 dBm and for the 2.4-GHz is -79 dBm to -85 dBm.

Configuring RxSOP (GUI)

Step 1 Choose **Wireless** > **Advanced** > **RxSOP Threshold** to configure the high, medium, and low RxSOP threshold values for each 802.11 band. The table below shows the RxSOP threshold values for high, medium and low levels for each 802.11 band.

Table 1: RxSOP Thresholds

802.11 Band	High Threshold	Medium Threshold	Low Threshold
5 GHz	-76 dBm	-78 dBm	-80 dBm
2.4 GHz	-79 dBm	-82 dBm	-85 dBm

Step 2 Choose **Wireless** > **RF Profiles** to configure the RxSOP threshold value for an RF profile. The **RF profiles** page is displayed.

a) Click the RF profile name to configure RxSOP threshold.
This displays the **RF Profile** > **Edit** page.

b) In the **High Density** tab, choose the RxSOP threshold value from the **Rx SOP Threshold** drop-down list.

Step 3 Save the configuration.

What to Do Next

Verify information about RxSOP thresholds for an 802.11 band by using the**show** {**802.11a** | **802.11b**} **extended** command.

Configuring RxSOP (CLI)

Step 1 Configure RxSOP threshold values for each 802.11 band by entering this command:
config {**802.11a** | **802.11b**} **rx-sop threshold** {**high | medium | low | auto**} {**ap** *ap_name* | **default**}

You can configure the RxSOP thresholds for an access point or on all access points in an 802.11 band.

Step 2 Configure RxSOP threshold values for an RF profile by entering this command:
config rf-profile rx-sop threshold {**high** | **medium** | **low** | **auto**} *profile_name*

Step 3 View information about RxSOP thresholds for an 802.11 band by entering this command:
show {**802.11a** | **802.11b**} **extended**

```
(Cisco Controller) > show 802.11a extended
Default 802.11a band Radio Extended Configurations:
    Beacon period: 100, range: 0 (AUTO);
    Multicast buffer: 0 (AUTO), rate: 0 (AUTO);
    RX SOP threshold: -76; CCA threshold: 0 (AUTO);

AP3600-XALE3  34:a8:4e:6a:7b:00
    Beacon period: 100, range: 0 (AUTO);
    Multicast buffer: 0 (AUTO), rate: 0 (AUTO);
    RX SOP threshold: -76; CCA threshold: 0 (AUTO);
AP54B4  3c:ce:73:6c:42:f0
    Beacon period: 100, range: 0 (AUTO);
    Multicast buffer: 0 (AUTO), rate: 0 (AUTO);
    RX SOP threshold: -76; CCA threshold: -80;
```