



# Configuring Radio Settings on an Access Point

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This module describes how to configure radio settings on a Cisco 800, 1800, 2800, or 3800 series integrated services router, hereafter referred to as an access point (AP).

## Finding Feature Information in This Module

*Your Cisco IOS software release may not support all of the features documented in this module.* To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the “[Feature Information for Configuring Radio Settings on an Access Point](#)” section on [page 29](#).

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Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

## Contents

- [Information About Configuring Radio Settings on an Access Point, page 2](#)
- [How to Configure Radio Settings on an Access Point, page 3](#)
- [Configuration Examples for Radio Settings on an Access Point, page 27](#)
- [Additional References, page 28](#)
- [Feature Information for Configuring Radio Settings on an Access Point, page 29](#)



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# Information About Configuring Radio Settings on an Access Point

Before you configure radio settings on an access point, you should understand the following concepts:

- [Wireless Device Roles in a Radio Network, page 2](#)
- [Universal Client Mode, page 3](#)

## Wireless Device Roles in a Radio Network

Table 6 shows the role in the radio network for each of the following devices.



### Note

Universal client mode is not supported on the 85x ISRs.

**Table 6** Device Role in Radio Network Configuration

Role in Radio Network	Cisco 800 Series ISRs	Cisco 1800 Series ISRs	Cisco 1841 Series ISRs	Cisco 2800 Series ISRs	Cisco 3800 Series ISRs
Root access point	X	X	X	X	X
Root bridge with or without clients	–	–	X	X	X
Nonroot bridge without clients	–	–	X	X	X
Universal client mode	X	X	X	X	X
Support of Workgroup bridge clients	X	X	X	X	X

## Data Rate Settings

You use the data rate settings to choose the data rates the AP uses for data transmission. The rates are expressed in megabits per second. The AP always attempts to transmit at the highest data rate set to **Basic**, also called **Require** on the browser-based interface. If there are obstacles or interference, the AP steps down to the highest rate that allows data transmission. You can set each data rate (1, 2, 5.5, and 11 megabits per second) to one of three states:

- **Basic** (this is the default state for all data rates)—Allows transmission at this rate for all packets, both unicast and multicast. At least one of the access point's data rates must be set to Basic.
- **Enabled**—The AP transmits only unicast packets at this rate; multicast packets are sent at one of the data rates set to Basic.
- **Disabled**—The AP does not transmit data at this rate.



### Note

At least one data rate must be set to **basic**.

You can use the data rate settings to set up an AP to serve client devices operating at specific data rates. For example, to set up the 2.4-GHz radio for 11 megabits per second (Mbps) service only, set the 11-Mbps rate to **Basic** and set the other data rates to **Enabled**. To set up the AP to serve only client devices operating at 1 and 2 Mbps, set 1 and 2 to **Basic** and set the rest of the data rates to **Enabled**. To set up the 5-GHz radio for 54 Mbps service only, set the 54-Mbps rate to **Basic** and set the other data rates to **Enabled**.

You can also configure the AP to set the data rates automatically to optimize either range or throughput. When you enter range for the data rate setting, the AP sets the 1 Mbps rate to basic and the other rates to enabled. When you enter throughput for the data rate setting, the AP sets all four data rates to basic.

## Universal Client Mode

Universal client mode is a wireless radio station role that allows the radio to act as a wireless client to another access point or repeater. This feature is exclusive to the integrated radio running in the Cisco 870, 1800, 2800, and 3800 integrated service routers (ISRs).

Universal client mode has the following features and limitations:

- You can configure universal client mode on the main **dot11radio** interface only, subinterfaces are not supported.
- Universal client can associate to access points with radio VLANs.
- Layer-3 routing is supported over the radio interface. However, there is no support for layer 2 (L2) bridging. The user cannot configure a dot11radio interface with a bridge-group when in universal client mode.
- Service Set Identifiers (SSIDs) are required to be configured on the dot11 interface operating as a universal client; association to an access point running in guest mode is not supported.
- The universal client can associate to Cisco access points, third party access points, and repeaters. It cannot associate to Cisco root bridges or Cisco workgroup bridges.
- Easy VPN does not support universal client mode using DHCP.

## How to Configure Radio Settings on an Access Point

This section contains the following tasks:

- [Configuring Universal Client Mode, page 4](#) (optional)
- [Configuring Radio Data Rates on an Access Point, page 5](#) (optional)
- [Configuring Radio and Client Device Power Levels on an Access Point, page 6](#) (optional)
- [Configuring Radio Channel Settings on an Access Point, page 8](#) (optional)
- [Configuring Dynamic Frequency Selection on an Access Point, page 10](#) (optional)
- [Enabling and Disabling World Mode on an Access Point, page 13](#) (optional)
- [Enabling and Disabling Short Radio Preambles on an Access Point, page 15](#) (optional)
- [Configuring Transmit and Receive Antennas on an Access Point, page 16](#) (optional)
- [Enabling and Disabling Aironet Extensions on an Access Point, page 17](#) (optional)
- [Configuring Ethernet Encapsulation Transformation Method on an Access Point, page 19](#) (optional)
- [Configuring Beacon Period and DTIM on an Access Point, page 21](#) (optional)

- [Configuring RTS Threshold and Retries on an Access Point, page 22](#) (optional)
- [Configuring Maximum Data Retry on an Access Point, page 24](#) (optional)
- [Configuring Packet Fragmentation Threshold on an Access Point, page 25](#) (optional)
- [Configuring IP Phone Support on an Access Point, page 26](#) (optional)

## Configuring Universal Client Mode

Perform this task to configure universal client mode.

You can configure universal client mode on a Cisco ISR series router by setting the radio interface station role to nonroot. This is different from configuring the dot11radio interface to operate in non-root bridge mode, which requires specifying the word bridge at the end of the command, for example, **station-role non-root bridge**.



### Note

In other Cisco wireless products such as the Cisco AP1232, the **station-role non-root** command operates the same as **station-role non-root bridge** command. On the ISRs, the two commands are different: **station-role non-root** is considered the universal client mode and **station-role non-root bridge** is considered the nonroot bridge mode.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio *interface***
4. **station-role {root [access-point | ap-only | bridge [wireless-clients]] | non-root [bridge]}**
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>Enter your password if prompted.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio interface</b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters configuration mode for the radio interface. <ul style="list-style-type: none"><li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li><li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li></ul>
Step 4	<b>station-role {root [access-point   ap-only   bridge [wireless-clients]]   non-root [bridge]}</b>  <b>Example:</b> Router(config-if)# station-role non-root	Sets the role of the radio interface.
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring Radio Data Rates on an Access Point

Perform this task to configure radio data rates.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio interface**
4. **speed {data-rates | default | ofdm-throughput | range | throughput}**
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio interface</b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters configuration mode for the radio interface. <ul style="list-style-type: none"> <li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>speed {data-rates   default   ofdm-throughput   range   throughput}</b>  <b>Example:</b> Router(config-if)# speed throughput	Configures the data rates supported by the access point. <ul style="list-style-type: none"> <li>Use the <b>no</b> form of the <b>speed</b> command to disable data rates. When you use the <b>no</b> form of the command, all data rates are disabled except the rates you name in the command.</li> </ul>
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring Radio and Client Device Power Levels on an Access Point

Perform this task to set the transmit power on your AP and the power level on client devices that associate to the access point.

When a client device associates to the access point, the AP sends the maximum power level setting to the client.

## SUMMARY STEPS

- enable**
- configure terminal**
- interface dot11Radio interface**

4. **power local {cck | ofdm} {milliwatt | maximum}**  
or  
**power local {milliwatt | maximum}**
5. **power client {milliwatt | maximum}**
6. **end**
7. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio interface</b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>power local {cck   ofdm} {milliwatt   maximum}</b> or <b>power local {milliwatt   maximum}</b>  <b>Example:</b> Router(config-if)# power local 20	(Optional) Specifies the local transmit power level, which reduces the radio cell size and interference between cells, on a 2.4-GHz, 802.11b/g radio.  or Specifies the local transmit power level on a 5-GHz, 802.11a radio. <ul style="list-style-type: none"> <li>On the 2.4-GHz radio, you can set CCK and OFDM power levels. On the 5-GHz radio, these keywords are not supported.</li> <li>For the 802.11b/g radio, the <i>milliwatt</i> argument can be 7, 10, 13, 15, 17, or 20. For the 802.11a radio, the <i>milliwatt</i> argument can be 4, 7, 10, 13, or 16.</li> <li>Use the <b>maximum</b> keyword to specify the maximum power level. This is the default setting.</li> </ul>

	Command or Action	Purpose
Step 5	<pre>power client {milliwatt   maximum}</pre> <p><b>Example:</b> Router(config-if)# power client 20</p>	(Optional) Specifies the maximum power level that clients should use for radio transmissions to the access point. <ul style="list-style-type: none"> <li>For the 802.11b/g radio, the <i>milliwatt</i> value can be 7, 10, 13, 15, 17, or 20. For the 802.11a radio, the <i>milliwatt</i> value can be 4, 7, 10, 13, or 16.</li> <li>Use the <b>maximum</b> keyword to specify the maximum power level.</li> <li>The default is for the AP to specify no specific client power level.</li> </ul>
Step 6	<pre>end</pre> <p><b>Example:</b> Router(config-if)# end</p>	Returns to privileged EXEC mode.
Step 7	<pre>copy running-config startup-config</pre> <p><b>Example:</b> Router# copy running-config startup-config</p>	(Optional) Saves your entries in the configuration file.

## Configuring Radio Channel Settings on an Access Point

Perform this task to set the access point's radio channel.

### Channel Settings

The default channel setting for the AP radios is least congested; at startup, the AP scans for and selects the least-congested channel. For most consistent performance after a site survey, however, we recommend that you assign a static channel setting for each access point. The channel settings on your AP correspond to the frequencies available in your regulatory domain.

Each 2.4-GHz channel covers 22 MHz. The bandwidth for channels 1, 6, and 11 does not overlap, so you can set up multiple access points in the same vicinity without causing interference.

The 5-GHz radio operates on up to 27 channels from 5170 to 5850 MHz. Each channel covers 20 MHz, and the bandwidth for the channels overlaps slightly. For best performance, use channels that are not adjacent (44 and 46, for example) for radios that are close to each other.



#### Note

Too many access points in the same vicinity creates radio congestion that can reduce throughput. A careful site survey can determine the best placement of access points for maximum radio coverage and throughput.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio** *interface*
4. **channel** {*number* | *MHz* | **least-congested**}

5. `end`
6. `copy running-config startup-config`

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p><b>Example:</b> Router&gt; enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<p><code>configure terminal</code></p> <p><b>Example:</b> Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><code>interface dot11Radio interface</code></p> <p><b>Example:</b> Router(config)# interface dot11Radio 0/3/0</p>	<p>Enters radio interface configuration mode.</p> <ul style="list-style-type: none"> <li>• The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>• The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<p><code>channel {number   MHz   least-congested}</code></p> <p><b>Example:</b> Router(config-if)# channel 2457</p>	<p>(Optional) Sets the default channel for the AP radio.</p>
Step 5	<p><code>end</code></p> <p><b>Example:</b> Router(config-if)# end</p>	<p>Returns to privileged EXEC mode.</p>
Step 6	<p><code>copy running-config startup-config</code></p> <p><b>Example:</b> Router# copy running-config startup-config</p>	<p>(Optional) Saves your entries in the configuration file.</p>

## Configuring Dynamic Frequency Selection on an Access Point

Perform this task to configure DFS on an access point with a 5-GHz radio.

### Dynamic Frequency Selection on Access Points with 5-GHz Radios

This section applies only to wireless access points shipped to Europe and Japan with 5-GHz radios running Cisco IOS version 12.4(6)T. Access points shipped to Europe and Japan with 5-GHz radios are required to use DFS to detect and avoid interfering with radar signals to comply with that regulatory domain.

The access point automatically sets the operating frequency on a DFS-enabled 5-GHz radio. A specific channel cannot be configured for DFS-enabled 5-GHz radios; the **channel** command is disabled.

**Note**

If the access point is set to use DFS and it is deployed in a regulatory domain that does not allow or does not require the use of DFS, disable DFS by using the **no dfs band block** interface configuration command.

DFS-enabled 5-GHz radios monitor the operating frequency for radar signals. If radar signals are detected on the channel, the access point takes these steps:

- Blocks new transmissions on the channel.
- Flushes the power-save client queues.
- Broadcasts an 802.11h channel-switch announcement.
- Disassociates remaining client devices.
- Randomly selects a different channel:
  - If the access point does not select a DFS-required channel, the access point enables beacons and accepts client associations.
  - If the access point selects a DFS required channel, the access point scans the new channel for radar signals for 60 seconds. If there are no radar signals on the new channel, the access point enables beacons and accepts client associations. If a radar signal is detected, the access point selects a different channel.

When a DFS-enabled 5-GHz radio operates on one of the following 15 channels, the access point automatically uses DFS to set the operating frequency:

- 52 (5260 MHz)
- 56 (5280 MHz)
- 60 (5300 MHz)
- 64 (5320 MHz)
- 100 (5500 MHz)
- 104 (5520 MHz)
- 108 (5540 MHz)
- 112 (5560 MHz)
- 116 (5580 MHz)
- 120 (5600 MHz)
- 124 (5620 MHz)

- 128 (5640 MHz)
- 132 (5660 MHz)
- 136 (5680 MHz)
- 140 (5700 MHz)

The maximum legal transmit power is greater for some 5-GHz channels than for others. When the access point randomly selects a 5-GHz channel on which power is restricted, the access point automatically reduces transmit power to comply with power limits for that channel.



#### Note

Cisco recommends using the **world-mode dot11d** *country-code* interface configuration command to configure a country code on DFS-enabled radios. The IEEE 802.11h protocol requires access points to include the country information element (IE) in beacons and probe responses. By default, however, the country code in the IE is blank. Use the **world-mode** command to populate the country code IE.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio** *interface*
4. **dfs band** *frequency-group* **block**
5. **end**
6. **show controllers dot11Radio** *interface*
7. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio</b> <i>interface</i>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/1	Enters interface configuration mode. <ul style="list-style-type: none"> <li>• The <i>interface</i> argument is in module/slot/port format, except for the Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>• The 5-GHz radio is port 1.</li> </ul>

	Command or Action	Purpose
Step 4	<p><b>dfs band</b> <i>frequency-group</i> <b>block</b></p> <p><b>Example:</b> Router(config-if)# dfs band 1 2 block</p>	<p>Prevents an access point from selecting a specific group of frequencies during DFS.</p> <ul style="list-style-type: none"> <li>The <i>frequency-group</i> value can be <b>1, 2, 3,</b> or <b>4</b>: <ul style="list-style-type: none"> <li><b>1</b> specifies frequencies 5.150 to 5.250 GHz.</li> <li><b>2</b> specifies frequencies 5.250 to 5.350 GHz.</li> <li><b>3</b> specifies frequencies 5.470 to 5.725 GHz.</li> <li><b>4</b> specifies frequencies 5.725 to 5.825 GHz.</li> </ul> </li> <li>At least one group of frequencies must be specified. Multiple groups are allowed.</li> </ul>
Step 5	<p><b>end</b></p> <p><b>Example:</b> Router(config-if)# end</p>	<p>Returns to privileged EXEC mode.</p>
Step 6	<p><b>show controllers dot11Radio</b> <i>interface</i></p> <p><b>Example:</b> Router# show controllers dot11Radio 0/0/1</p>	<p>(Optional) Displays radio controller status.</p> <ul style="list-style-type: none"> <li>The Current Frequency line of the output displays the status of DFS, for example: Current Frequency: 5300 MHz Channel 60 (DFS enabled)</li> </ul>
Step 7	<p><b>copy running-config startup-config</b></p> <p><b>Example:</b> Router# copy running-config startup-config</p>	<p>(Optional) Saves your entries in the configuration file.</p>

## Enabling and Disabling World Mode on an Access Point

Perform this task to configure the AP to support 802.11d world mode or Cisco legacy world mode.

When you enable world mode, the AP adds channel carrier set information to its beacon. Client devices with world mode enabled receive the carrier set information and adjust their settings automatically. For example, a client device used primarily in Japan could rely on world mode to adjust its channel and power settings automatically when it travels to Italy and joins a network there. World mode is disabled by default.

Aironet extensions must be enabled for world mode operation. Aironet extensions are enabled by default.



### Note

World mode is not supported on the 5-GHz radio.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio *interface***
4. **world-mode {legacy | dot11d country-code *code*} {indoor | outdoor | both}**
5. **end**
6. **copy running-config startup-config**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio <i>interface</i></b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>• The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>• The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>world-mode {legacy   dot11d country-code <i>code</i>} {indoor   outdoor   both}</b>  <b>Example:</b> Router(config-if)# world-mode legacy indoor	Enables AP world mode operation. <ul style="list-style-type: none"> <li>• The example enables Cisco legacy world mode and specifies that the AP is indoors.</li> </ul>

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 5</b>	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
<b>Step 6</b>	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Enabling and Disabling Short Radio Preambles on an Access Point

Perform this task to enable or disable short radio preambles.

### Radio Preambles

The radio preamble (sometimes called a *header*) is a section of data at the head of a packet that contains information that the AP and client devices need when sending and receiving packets. You can set the radio preamble to long or short:

- **Short**—A short preamble improves throughput performance. Cisco Aironet Wireless LAN Client Adapters support short preambles. Early models of Cisco Aironet's Wireless LAN Adapter (PC4800 and PC4800A) require long preambles.
- **Long**—A long preamble ensures compatibility between the AP and all early models of Cisco Aironet Wireless LAN Adapters (PC4800 and PC4800A). If these client devices do not associate to your access points, you should use short preambles.

**Note**

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You cannot configure short or long radio preambles on the 5-GHz radio.

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### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio** *interface*
4. **preamble-short**
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio interface</b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>preamble-short</b>  <b>Example:</b> Router(config-if)# no preamble-short	Disables short preambles and enables long preambles. <ul style="list-style-type: none"> <li>Short preambles are enabled by default. Use the <b>preamble-short</b> command to reenables short preambles if they are disabled.</li> </ul>
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring Transmit and Receive Antennas on an Access Point

Perform this task to select the antenna the AP uses to transmit and receive data.

## SUMMARY STEPS

- enable**
- configure terminal**
- interface dot11Radio interface**
- antenna {receive | transmit} {diversity | left | right}**
- end**
- copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>Enter your password if prompted.</li></ul>
Step 2	<code>configure terminal</code>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<code>interface dot11Radio interface</code>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"><li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li><li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li></ul>
Step 4	<code>antenna {receive   transmit} {diversity   left   right}</code>  <b>Example:</b> Router(config-if)# antenna receive right	Sets the transmit or receive antenna to diversity, left, or right.   <b>Note</b> For best performance, leave the transmit antenna setting at the default setting, <b>diversity</b> .
Step 5	<code>end</code>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<code>copy running-config startup-config</code>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Enabling and Disabling Aironet Extensions on an Access Point

Perform this task to enable or disable Cisco Aironet extensions to the IEEE 802.11b standard.

Aironet extensions are enabled by default.

### Benefits of Enabling Aironet Extensions

By default, the AP uses Cisco Aironet 802.11 extensions to detect the capabilities of Cisco Aironet client devices and to support features that require specific interaction between the AP and associated client devices. Aironet extensions must be enabled to support these features:

- Load balancing—The AP uses Aironet extensions to direct client devices to an AP that provides the best connection to the network based on factors such as number of users, bit error rates, and signal strength.

- Message Integrity Check (MIC)—MIC is an additional WEP security feature that prevents attacks on encrypted packets called bit-flip attacks. The MIC, implemented on both the AP and all associated client devices, adds a few bytes to each packet to make the packets tamper-proof.
- Temporal Key Integrity Protocol (TKIP)—TKIP, also known as WEP key hashing, is an additional WEP security feature that defends against an attack on WEP in which the intruder uses an unencrypted segment called the initialization vector (IV) in encrypted packets to calculate the WEP key.
- Repeater mode—Aironet extensions must be enabled on repeater access points and on the root access points to which they associate.
- World mode—Client devices with world mode enabled receive carrier set information from the AP and adjust their settings automatically.
- Limiting the power level on associated client devices—When a client device associates to the access point, the AP sends the maximum allowed power level setting to the client.

Disabling Aironet extensions disables the features listed above, but it sometimes improves the ability of non-Cisco client devices to associate to the access point.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio** *interface*
4. **dot11 extension aironet**
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code>  <b>Example:</b> Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<code>configure terminal</code>  <b>Example:</b> Router# <code>configure terminal</code>	Enters global configuration mode.
Step 3	<code>interface dot11Radio interface</code>  <b>Example:</b> Router(config)# <code>interface dot11Radio 0/3/0</code>	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<code>no dot11 extension aironet</code>  <b>Example:</b> Router(config-if)# <code>no dot11 extension aironet</code>	Disables Aironet extensions. <ul style="list-style-type: none"> <li>Use the <b>dot11 extension aironet</b> command to enable Aironet extensions if they are disabled.</li> </ul>
Step 5	<code>end</code>  <b>Example:</b> Router(config-if)# <code>end</code>	Returns to privileged EXEC mode.
Step 6	<code>copy running-config startup-config</code>  <b>Example:</b> Router# <code>copy running-config startup-config</code>	(Optional) Saves your entries in the configuration file.

## Configuring Ethernet Encapsulation Transformation Method on an Access Point

Perform this task to configure the encapsulation transformation method.

### Encapsulation Types

When the AP receives data packets that are not 802.3 packets, the AP must format the packets to 802.3 using an encapsulation transformation method. These are the two transformation methods:

- dot1h (802.1H)**—This method provides optimum performance for Cisco Aironet wireless products.
- RFC 1042**—Use this setting to ensure interoperability with non-Cisco Aironet wireless equipment. RFC 1042 does not provide the interoperability advantages of 802.1H but is used by other manufacturers of wireless equipment. This is the default setting.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio *interface***
4. **payload-encapsulation {rfc1042 | dot1h}**
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio <i>interface</i></b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>• The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>• The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>payload-encapsulation {rfc1042   dot1h}</b>  <b>Example:</b> Router(config-if)# no dot11 extension aironet	Specifies the encapsulation transformation method to RFC 1042 (SNAP) or dot1h (IEEE 802.1h).
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring Beacon Period and DTIM on an Access Point

Perform this task to configure the beacon period and delivery traffic indication message (DTIM).

The beacon period is the amount of time between AP beacons in Kilo microseconds. One kilomicrosecond equals 1,024 microseconds. The Data Beacon Rate, always a multiple of the beacon period, determines how often the beacon contains a DTIM. The DTIM tells power-save client devices that a packet is waiting for them.

For example, if the beacon period is set at 100, its default setting, and the data beacon rate is set at 2, its default setting, then the AP sends a beacon containing a DTIM every 200 kilomicroseconds.

The default beacon period is 100, and the default DTIM is 2.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio** *interface*
4. **beacon** {**period** *microseconds* | **dtim-period** *period-count*}
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>Enter your password if prompted.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio interface</b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters configuration mode for the radio interface. <ul style="list-style-type: none"><li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li><li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li></ul>
Step 4	<b>beacon {period microseconds   dtim-period period-count}</b>  <b>Example:</b> Router(config-if)# beacon period 15	Specifies how often the beacon contains a Delivery Traffic Indicator Message (DTIM).
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring RTS Threshold and Retries on an Access Point

Perform this task to set the Request-to-Send (RTS) threshold and number of retries.

The RTS threshold determines the packet size at which the AP issues a request to send (RTS) before sending the packet. A low RTS Threshold setting can be useful in areas where many client devices are associating with the access point, or in areas where the clients are far apart and can detect only the AP and not each other. You can enter a setting ranging from 0 to 2347 bytes.

Maximum RTS Retries is the maximum number of times the AP issues an RTS before stopping the attempt to send the packet over the radio. Enter a value from 1 to 128.

The default RTS threshold is 2312, and the default maximum RTS retries setting is 32.

## SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `interface dot11Radio interface`
4. `rts {threshold bytes | retries number}`
5. `end`
6. `copy running-config startup-config`

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p><b>Example:</b> Router&gt; enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<p><code>configure terminal</code></p> <p><b>Example:</b> Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><code>interface dot11Radio interface</code></p> <p><b>Example:</b> Router(config)# interface dot11Radio 0/3/0</p>	<p>Enters radio interface configuration mode.</p> <ul style="list-style-type: none"> <li>• The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>• The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<p><code>rts {threshold bytes   retries number}</code></p> <p><b>Example:</b> Router(config-if)# rts retries 30</p>	<p>Sets the RTS threshold or maximum RTS retries number.</p>
Step 5	<p><code>end</code></p> <p><b>Example:</b> Router(config-if)# end</p>	<p>Returns to privileged EXEC mode.</p>
Step 6	<p><code>copy running-config startup-config</code></p> <p><b>Example:</b> Router# copy running-config startup-config</p>	<p>(Optional) Saves your entries in the configuration file.</p>

## Configuring Maximum Data Retry on an Access Point

Perform this task to specify the number of attempts the AP makes to send a packet before giving up and dropping the packet.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio *interface***
4. **packet retries *number***
5. **end**
6. **copy running-config startup-config**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio <i>interface</i></b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>• The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>• The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>packet retries <i>number</i></b>  <b>Example:</b> Router(config-if)# rts retries 30	Specifies the number of attempts the AP makes to send a packet before giving up and dropping the packet.
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring Packet Fragmentation Threshold on an Access Point

Perform this task to configure the size at which packets are fragmented (sent as several pieces instead of as one block).

Use a low setting in areas where communication is poor or where there is a great deal of radio interference.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dot11Radio** *interface*
4. **fragment-threshold** *bytes*
5. **end**
6. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface dot11Radio interface</b>  <b>Example:</b> Router(config)# interface dot11Radio 0/3/0	Enters radio interface configuration mode. <ul style="list-style-type: none"> <li>The <i>interface</i> argument is in module/slot/port format, except for the Cisco 800 series and Cisco 1800 series fixed-configuration routers, where the <i>interface</i> argument is either 0 or 1.</li> <li>The 2.4-GHz radio is port 0, and the 5-GHz radio is port 1.</li> </ul>
Step 4	<b>fragment-threshold bytes</b>  <b>Example:</b> Router(config-if)# rts retries 30	Sets the size at which packets are fragmented.
Step 5	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 6	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuring IP Phone Support on an Access Point

Perform this task to enable 802.11 compliance phone support.

Enabling IEEE 802.11 compliance phone support adds information to the AP beacons and probe responses. This information helps some 802.11 phones make intelligent choices about the AP to which they should associate. Some phones do not associate with an AP without this additional information.

## SUMMARY STEPS

- enable
- configure terminal
- dot11 phone
- end
- copy running-config startup-config

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
Step 2	<code>configure terminal</code>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<code>dot11 phone</code>  <b>Example:</b> Router(config)# dot11 phone	Enables IEEE 802.11 compliance phone support.
Step 4	<code>end</code>  <b>Example:</b> Router(config-if)# end	Returns to privileged EXEC mode.
Step 5	<code>copy running-config startup-config</code>  <b>Example:</b> Router# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

## Configuration Examples for Radio Settings on an Access Point

This section contains the following examples:

- [Configuring Radio Data Rates: Example](#)

### Configuring Radio Data Rates: Example

The following example shows how to disable the 1-Mbps data rate and set the rest of the data rates to **basic**:

```
configure terminal
interface dot11radio 0
no speed basic-2.0 basic-5.5 basic-11.0
end
copy running-config startup-config
```

## Additional References

The following sections provide references related to configuring radio settings on an access point.

### Related Documents

Related Topic	Document Title
Cisco IOS wireless LAN commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<i>Cisco IOS Wireless LAN Command Reference</i>

### Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	—

### MIBs

MIB	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

### RFCs

RFC	Title
No new or modified RFCs are supported, and support for existing RFCs has not been modified.	—

### Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a>

# Feature Information for Configuring Radio Settings on an Access Point

Table 7 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.4T or later appear in the table.

For information on a feature in this technology that is not documented here, see the “[Cisco IOS Wireless LAN Features Roadmap](#)” module.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.



## Note

Table 7 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

**Table 7** Feature Information for Configuring Radio Settings on an Access Point

Feature Name	Releases	Feature Information
Access Point Link Role Flexibility	12.4(15)T	This feature allows access point radios to operate in a combination of radio roles, such as access point root, access point repeater, bridge root (with or without clients), bridge nonroot (with or without clients), and WGB.  The following sections provide information about this feature: <ul style="list-style-type: none"> <li><a href="#">Configuring Universal Client Mode</a></li> </ul>
Universal Client Mode	12.4(15)T	This feature allows a wireless device to associate to other Cisco and third-party APs.  The following sections provide information about this feature: <ul style="list-style-type: none"> <li><a href="#">Universal Client Mode</a></li> <li><a href="#">Configuring Universal Client Mode</a></li> </ul>
Wireless Non-Root Bridge	12.4(15)T	This feature allows a wireless device to operate as the remote node in a point-to-point or point-to-multi-point network.  The following sections provide information about this feature: <ul style="list-style-type: none"> <li><a href="#">Configuring Universal Client Mode</a></li> </ul>

Table 7 Feature Information for Configuring Radio Settings on an Access Point

Feature Name	Releases	Feature Information
Cisco Compatible Extensions Information Element	12.4T	<p>This feature allows a Cisco access point to inform Cisco Compatible Extension client devices about the Cisco-compatible release version that the access point supports.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Enabling and Disabling Aironet Extensions on an Access Point, page 17</a></li> </ul>
Configurable Radio Transmit Power	12.4T	<p>This feature allows a user to set the transmit power of the access point.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>
Dynamic Frequency Selection (DFS) and IEEE 802.11h Transmit Power Control	12.4T	<p>This feature allows a user to block groups of channels to prevent an access point from selecting them when DFS is enabled.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Dynamic Frequency Selection on an Access Point, page 10</a></li> </ul>
IEEE 802.11 Wireless Standards Support	12.4T	<p>This feature provides support for 802.11 standards, which allows you to set channels, transmission rates, and power-save mode, among other configurable fields.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>
IEEE 802.11a Support	12.4T	<p>This feature provides support for 802.11a standards, which allows you to set channels, transmission rates, and power-save mode, among other configurable fields.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>
IEEE 802.11b Support	12.4T	<p>This feature provides support for 802.11b standards, which allows you to set channels, transmission rates, and power-save mode, among other configurable fields.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>

**Table 7** Feature Information for Configuring Radio Settings on an Access Point

Feature Name	Releases	Feature Information
IEEE 802.11d Support	12.4T	<p>This feature provides support for 802.11d standards, which allows you to set channels, transmission rates, and power-save mode, among other configurable fields.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Enabling and Disabling World Mode on an Access Point, page 13</a></li> </ul>
IEEE 802.11g Support	12.4T	<p>This feature provides support for 802.11g standards, which allows you to set channels, transmission rates, and power-save mode, among other configurable fields.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>
Transmit Power Control	12.4T	<p>This feature allows client devices to calculate the path loss and the transmit power necessary for the client to reach the access point, thereby extending client device battery life.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>
Wireless Access Point High-Speed WAN Interface Card	12.4T	<p>This feature provides support for two new AP HWICs.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuring Radio and Client Device Power Levels on an Access Point, page 6</a></li> </ul>
World Mode	12.4T	<p>This feature automates client configuration of channel and transmit power settings allowing world-mode-enabled access points to configure the settings on world-mode-enabled clients. World mode is supported only on the 2.4-GHz radio.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Enabling and Disabling World Mode on an Access Point, page 13</a></li> </ul>

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