



## Using the Radio Manager

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The Radio Manager simplifies the deployment, expansion, and day-to-day management of your WLAN radio environment. Using the Radio Manager, you can:

**Table 13-1 Radio Manager Features**

<b>Feature</b>	<b>For More Information, See:</b>
Continuously monitor the radio environment	<a href="#">Using Radio Monitoring to Collect RM Data, page 13-2</a>
Evaluate current AP radio performance on a per-floor basis against baselined performance data	<a href="#">Evaluating AP Radio Performance, page 13-9</a>
Adjust APs to cover potential areas of lost coverage	<a href="#">Healing Your Network, page 13-16</a>
Feed Frame Monitoring information to a third-party server for further analysis	<a href="#">Using Frame Monitoring, page 13-28</a>
Generate Radio Manager reports	<a href="#">Displaying Radio Manager Reports, page 13-37</a>

# Getting Started with Radio Manager

Before you can use the features provided by the Radio Manager, you must set up your network to manage your radio environment. To configure your network, see [Configuring Your WLAN Radio Environment, page 12-1](#).

**Caution**

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If your network is not properly configured, *none of the Radio Manager functions will work*.

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## Using Radio Monitoring to Collect RM Data

Radio location measurements characterize the radio environment and provide the information other Radio Manager features require to determine the channels and power limits for each Basic Service Set (BSS).

To gather these measurements, Radio Monitoring must be enabled. Radio Monitoring periodically gathers radio frequency statistics, identifies specific signal sources, and *is your primary means of detecting rogue access points*.

The following topics explain how and where to use Radio Monitoring:

- [Understanding Radio Monitoring, page 13-3](#)
- [Guidelines for Running Radio Monitoring, page 13-4](#)
- [Starting Radio Monitoring, page 13-6](#)

You can also use the Assisted Site Survey wizard to walk you through the process of determining optimal radio transmit power and channel selection. This wizard interface helps you through AP radio scan, client walkabout, and radio parameter generation.

**Related Topics**

- [Understanding Radio Management, page 12-8](#)

# Understanding Radio Monitoring

Radio Monitoring:

- Is enabled by default.

**Note**

If you disable Radio Monitoring and do not run AP Radio Scan, no unknown radios (rogue or friendly) will be detected. If you run AP Radio Scan but disable Radio Monitoring, some unknown radios will be detected, but not as many as would be detected if Radio Monitoring was running.

- Runs on the specified Cisco IOS APs and its associated CCXV2-compliant clients.
- Continuously monitors the WLAN radio environment.
- Measures the path loss or RSSI between APs and between regular APs and their clients.
- Monitors client registration data for scanning-only APs.
- Discovers any new APs that are transmitting beacons.
- Generates alerts when new APs appear or interference occurs.

## How It Works

During normal operation, the Radio Manager requests measurements from Cisco APs and clients to monitor the WLAN radio frequency environment. These measurements occur less frequently than during a client walkabout (see [Using Client Walkabouts to Collect RM Data, page 14-73](#)), typically one or more minutes apart.

Radio Monitoring allows you to select which channels are monitored; both APs and clients can measure serving channels (the channel on which the AP is transmitting) and non-serving channels (the channels on which the AP is *not* transmitting). You make this choice when you enable Radio Monitoring (see [Starting Radio Monitoring, page 13-6](#)).

Radio Monitoring only monitors managed devices that appear in its Selected Devices list. When Radio Monitoring is enabled, all devices in this list are monitored. There are two ways to monitor newly added APs:

- By default, any newly managed device is added to the Selected Devices list, regardless of the Radio Monitoring enable status.
- As long as the **Add Newly Managed AP to Selected AP List** check box is selected, *future* newly-managed APs will be automatically added to Radio Monitoring's Selected Devices list. This check box only affects devices that are managed *after this setting has been saved*.



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**Note** Radio Monitoring will be turned on for newly-managed devices only if Radio Monitoring has been enabled (see [Starting Radio Monitoring, page 13-6](#)).

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#### Data Produced

Radio Monitoring periodically gathers radio frequency statistics and identifies specific signal sources. The channel measurements it collects are used for many features, such as radio configuration, rogue AP discovery, interference detection, network self-healing, auto re-site surveys, and certain Radio Manager reports.



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**Note** Radio Monitoring is enabled by default. *If you disable Radio Monitoring, you will not have access to these features.*

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#### Related Topics

- [Guidelines for Running Radio Monitoring, page 13-4](#)
- [Healing Your Network, page 13-16](#)

## Guidelines for Running Radio Monitoring

#### Prerequisites

Before running Radio Monitoring, you must:

1. Configure your network for radio management (see [Getting Started with Radio Manager, page 13-2](#)).

2. Define the location elements (buildings and floors) and place the APs on the floor images. This step is optional, but will help you get the best results from the Location Manager displays. For more information, see:
  - [Entering Building Information, page 14-4](#)
  - [Adding Floors to Location Manager, page 14-11](#)
  - [Adding Devices to Floors, page 14-18](#)

### Tips

- Leave Radio Monitoring continuously running on your network so new APs are discovered promptly, the necessary faults are generated, and your reports are accurate and current.
- You can add an AP to the Radio Monitoring list and also include it in an AP Radio Scan or Client Walkabout; the measurement requests for these two features supersede the Radio Monitoring requests. When the other, shorter term procedures end, the APs return to normal radio monitoring mode.
- Radio Monitoring produces the data for these reports:
  - The Path Loss Between Managed APs report contains the calculated path loss data (see [Viewing Current Path Loss Results, page 11-22](#)).
  - The Channel Loading report lets you see how busy the environment is before you deploy new sets of access points (see [Viewing Current Channel Load Results, page 11-25](#)).
- To detect rogue APs, you should enable both [serving channel](#) (the channel on which the AP is transmitting) and [non-serving channel](#) scanning (the channels on which the AP is *not* transmitting). If only serving channel scanning is enabled, then only the APs configured on the same channel as the rogue will actually report the rogue. By monitoring non-serving channels as well, Radio Manager can detect rogue APs that might not have been discovered had it monitored only the channel on which the AP is transmitting.
- By default, newly managed devices are automatically added to Radio Monitoring's Selected Devices list (see [Starting Radio Monitoring, page 13-6](#)). To manually add new devices to this list, select **Radio Mgr > Radio Monitoring > Select Options** and *deselect* the **Add Newly Managed AP to Selected AP List** check box. While that check box is *not* checked, newly managed devices are *not* automatically added to the Selected Devices list and you will have to manually select each AP using **Radio Mgr > Radio Monitoring > Select AP**.



**Note** Radio Monitoring will be turned on for newly-managed devices only if Radio Monitoring has been enabled (see [Starting Radio Monitoring, page 13-6](#)).

#### Related Topics

- [Understanding Radio Monitoring, page 13-3](#)
- [Detecting Rogue APs, page 15-16](#)

## Starting Radio Monitoring



**Note** Your login determines whether you can use this procedure.

#### Before You Begin

Satisfy the Radio Monitoring prerequisites (see [Guidelines for Running Radio Monitoring, page 13-4](#)).

#### Procedure

- Step 1** Select **Radio Mgr > Radio Monitoring**. The Radio Monitoring Options window appears.
- Step 2** Complete the following:

Field	Description
Enable/Disable	Click <b>Enable</b> to re-enable Radio Monitoring.  <b>Note</b> Radio Monitoring is your primary means of detecting rogue APs and is therefore enabled by default. <i>If you disable Radio Monitoring</i> , you will not have access to many features, including rogue AP detection, self-healing networks, auto re-site surveys, and certain Radio Manager reports.

Field	Description
Serving Channel Monitoring	<p>Select one or both check boxes to collect measurements on the channel the devices are configured to:</p> <ul style="list-style-type: none"> <li>• <b>APs</b> to perform monitoring measurements on the Cisco IOS APs on the serving channel (the channel on which the AP is transmitting).</li> <li>• <b>Clients</b> to perform monitoring measurements on CCXV2-compliant clients on the serving channel.</li> </ul>
Non-Serving Channel Monitoring	<p>Select one or both check boxes to measure other channels in the band:</p> <ul style="list-style-type: none"> <li>• <b>APs</b> to perform monitoring measurements on the Cisco IOS APs on the <b>non-serving channels</b> (the channels on which the AP is <i>not</i> transmitting).</li> <li>• <b>Clients</b> to perform monitoring measurements on CCXV2-compliant clients on the non-serving channels.</li> </ul> <p><b>Note</b> By monitoring non-serving channels as well as serving channels, Radio Manager can detect rogue APs that might not have been discovered had it monitored only the channel on which the AP is transmitting.</p>

Field	Description
Add Newly Managed AP to Selected AP List	<p>Select to add future newly-managed APs to the Selected Devices list in <a href="#">Step 3</a>.</p> <p><b>Note</b> If you deselect this check box, newly managed devices will <i>not</i> be automatically added to the Selected Devices list. You will have to <i>manually</i> move newly managed devices from the Available Devices list to the Selected Devices list.</p> <p><b>Note</b> This check box affects devices that are managed <i>only after this setting has been saved</i>.</p> <p><b>Note</b> Even if this check box is selected and the devices are appearing in the Selected Devices list, Radio Monitoring is enabled for those devices <i>only if the Enable check box has also been previously selected and saved</i>.</p>

**Step 3** From the menu in the left pane, click **Select AP**. All managed devices are listed in the Device selector in the middle pane.

**Step 4** Select the devices you want to monitor (see [Using the Device Selector, page 1-17](#)).



**Note** If the **Add Newly Managed AP to Selected AP List** check box (see [Step 2](#)) is *not* checked, newly managed devices are *not* automatically added to the Selected Devices list.

**Step 5** From the menu in the left pane, click **Filter By PHY** to select the type of 802.11 radio that you want to monitor.



**Note** Only radios of the selected types are monitored. If a selected AP has no interfaces of the desired radio types, this is noted in the job run log.

- Step 6** To save your settings, click **Finish** from the menu in the left pane. The Finish dialog box appears.
- Step 7** Click **Save** to save your Radio Monitoring options.
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#### Related Topics

- [Viewing Current Path Loss Results, page 11-22](#)
- [Viewing Current Channel Load Results, page 11-25](#)
- [Displaying Radio Manager Reports, page 13-37](#)
- [Understanding Radio Monitoring, page 13-3](#)

## Evaluating AP Radio Performance

The following sections will help you understand how to use the Radio Manager Auto Re-Site Survey feature to evaluate AP radio performance:

- [Understanding Auto Re-Site Survey, page 13-9](#)
- [Guidelines for Running Auto Re-Site Surveys, page 13-10](#)
- [Establishing Baseline Data, page 13-11](#)
- [Monitoring AP Radio Performance, page 13-14](#)

## Understanding Auto Re-Site Survey

Auto Re-Site Survey extends the Radio Manager Assisted Site Survey Wizard functionality. It periodically evaluates the current AP radio performance on a per-floor basis against baselined performance data that you specify (see [Guidelines for Running Auto Re-Site Surveys, page 13-10](#)) and alerts the user when the performance falls below a preset threshold.

#### How It Works

The Auto Re-Site Survey option uses data collected from previous RM Assisted Configuration jobs to compare the current performance of the selected APs against the performance data collected the last time radio parameter generation was generated for the specified APs and applied to the specific floor. If the APs'

radio performance has decreased by 20% (a user-configurable setting), a fault is generated and you are asked if you want to generate new radio parameters. The new radio parameters are compared against the existing data, and if the newly generated radio parameter yield better results, you can apply the new radio parameters to the selected APs.

### Data Produced

Auto Re-Site Survey generates a fault if the radio performance of the specified floor decreases by the specified percentage. It also allows you to generate new radio parameters and apply those parameters to the APs of the specified floor. (See [Establishing Baseline Data](#), page 13-11.)

## Guidelines for Running Auto Re-Site Surveys

### Prerequisites

Before you run Auto Re-Site Survey, you must:

1. Configure your network for radio management (see [Getting Started with Radio Manager](#), page 13-2).
2. Define the location elements (buildings and floors) and place the APs on the floor images. This step is optional, but will help you get the best results from the Location Manager displays. For more information, see:
  - [Entering Building Information](#), page 14-4
  - [Adding Floors to Location Manager](#), page 14-11
  - [Adding Devices to Floors](#), page 14-18
3. Perform an AP Radio Scan on all APs on the specified floor (see [Using AP Radio Scans to Collect RM Data](#), page 14-58).
4. Be sure that Radio Monitoring is enabled on all APs on the specified floor. Radio Monitoring is enabled by default; if it has been disabled, you must re-enable it (see [Using Radio Monitoring to Collect RM Data](#), page 13-2).

### Tips

- You cannot modify the “total throughput” and “coverage details” values after the WLSE has produced the survey results of an Automated Re-site Survey; these values are computed based upon current Radio Management data values.

You can, however, set a percentage value before you save the Auto Re-Site Survey settings. The percentage you set for a floor or building will be monitored with respect to the base for throughput and coverage. For example, if you set the percentage to 15%, WLSE issues a fault whenever the throughput or coverage values have more than a 15% change in the value (up or down) you previously set.

If you would like to change those values, perhaps to increase performance, use RM Assisted Configuration and Client Walkabout to fine-tune the network configuration.

#### Related Topics

- [Understanding Auto Re-Site Survey, page 13-9](#)

## Establishing Baseline Data

The Auto Re-Site Survey feature compares the current performance of the selected APs against baseline performance data for a floor. You can also use Auto Re-Site Survey to establish this baseline data.



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**Note** You should establish a set of baseline data only after you have determined that your network is stable and the parameter settings are optimal.

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#### Typical Scenarios and FAQs

- I want to save the current performance data as the base data for future comparisons.



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**Note** Your login determines whether you can use this option.

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#### Before You Begin

Satisfy the Auto Re-Site Survey prerequisites (see [Guidelines for Running Auto Re-Site Surveys, page 13-10](#)).

### Procedure

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- Step 1** Select **Radio Mgr > Auto Re-Site Survey**. The Review Current screen displays the building, floor, and frequency band of the APs on the specified floor that are already enabled for Auto Re-Site Survey.
- Step 2** From the menu in the left pane, click **Select Floor**, then select a building from the Floors Selector list. The floors for the selected building appear in the Available Floors list.
- Step 3** Click on a floor, and click the right arrows (>>) to add it to the Selected Floors list.
- Step 4** From the menu in the left pane, click **Set Base Values**. The default is to calculate the performance of all floors. You can select individual floors from the Selected Floors pull-down menu and set its baseline data.
- Step 5** To set the baseline values for *all floors*, click **Compute and Apply**. The current performance data for each floor (specified in Step 3) is calculated and becomes the baseline performance data for future comparisons.
- Step 6** To set the baseline values *for individual floors*:
- a. Select a floor from the Selected Floors dropdown list. The current values for that floor are displayed.
  - b. For one or both radio types, select:
    - **Re-evaluate** to evaluate the current performance of the selected floor.
    - **Current > Base** to make the current data the base for future comparisons.

Now that you have selected your Auto Re-Site Survey options, you need to save your settings.

**Step 7** Click **Finish**. The Finish screen displays the current fault settings:

Field	Description
Enable	Select to enable Auto Re-Site Survey.  <b>Note</b> On floors for which Auto ReSite Survey is enabled, both Serving and Non-Serving Channel Radio Monitoring must be enabled for all APs (see <a href="#">Using Radio Monitoring to Collect RM Data, page 13-2</a> ).
Settings	From the dropdown lists, select the severity level and percentage values. The severity level will be assigned to the fault when the radio performance of the AP decreases by the specified percentage.

**Step 8** Click **Save** to save your settings.

**Step 9** To view the log generated by the Auto Re-Site Survey process:

- a. Click **Review Current** from the menu in the left pane.
- b. Click **ARSS Run Log** (located below the list of buildings, floors, and frequencies). The ARSS Run Log table appears in a separate browser window. This table contains the following information for each run:

Field	Description
Select Run	Select this button to see the details for that run.  The details for the selected job run appear below the list of runs for that job.
Start Time	The time the job started.
End Time	The time the job ended.

- c. The Auto Re-Site Survey run log for the selected run appears below this table. To view the details for a different run, select another run from the table and click **ARSS Run Log**.
- d. To be certain that you are looking at the latest information, click the **Refresh** button to refresh the job list.

**Step 10** Every hour, the collected baseline data is compared against the current performance. If there is a 20% (default value) degradation in performance, a fault is generated.

In the Faults Detail Conditions table for an Auto Re-Site Survey fault, the presence of an icon (a note pad with glasses) between the Description and Timestamp columns in the Fault Detail Conditions table indicates that there is additional building and floor information for this fault. Select the icon to view these details (see [Monitoring AP Radio Performance, page 13-14](#)).

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#### Related Topics

- [Guidelines for Running Auto Re-Site Surveys, page 13-10](#)
- [Device Fault Details, page 3-11](#)
- [Displaying Radio Manager Reports, page 13-37](#)

## Monitoring AP Radio Performance

Use **Faults > Display Faults > Fault Details** to view the fault that is generated when any AP radio performance degradations are detected.

#### Typical Scenarios and FAQs

- I want to monitor the performance of an AP radio.
- I have just been notified of a decrease in the radio performance of an AP and I want to view the total throughput and coverage details.
- I have just been notified of a decrease in the radio performance of an AP and I have determined it is no longer a problem. I want to clear the fault.



#### Note

Your login determines whether you can use this option.

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#### Before You Begin

Establish baseline performance data for each floor (see [Establishing Baseline Data, page 13-11](#)).

## Procedure

- Step 1** Select **Faults > Display Faults**. The Faults Summary screen appears.
- Step 2** Select the filtering criteria to display any faults related to AP radio performance degradation.
- Step 3** To display more information about a fault, click the Description or Timestamp fields in the Fault Summary table for that fault.

The Fault Details screen displays details about the device, its current fault conditions, and a fault history (see [Viewing Fault Details, page 3-10](#)).

- Step 4** The presence of an icon (a note pad with glasses) between the Description and Timestamp columns in the Fault Detail Conditions table indicates that there is additional information about an AP radio performance degradation fault.

If you select this icon, a new window displays the following information:

**Table 13-2 Auto Re-Site Survey Fault Details**

Column	Description
Faults Details (first row)	See <a href="#">Device Fault Details, page 3-11</a>
Building	All buildings that have performance degradations.  <b>Note</b> Performance degradations are defined as a 20% difference between the base and current performance values.
Floor	All floors that have performance degradations.
Auto Re-Site Survey Details	A note pad with glasses icon. Click this icon to display the Auto Re-Site Survey Details window.

The Auto Re-Site Survey Details window displays the following information for the selected floor:

**Table 13-3 Auto Re-Site Survey Details Window**

Column	Description
Faults Details (first row)	See <a href="#">Device Fault Details, page 3-11</a>
PHY Type	The type of 802.11 radio (11a or 11b/11g).

**Table 13-3 Auto Re-Site Survey Details Window (continued)**

Column	Description
Timestamp	Indicates the time, based on the client browser, that the performance readings were collected for that band on that floor.
Dataset	CURRENT or BASELINE. The BASELINE dataset contains the initial readings for a floor; the CURRENT dataset contains the current values. A fault is issued when there is a 20% difference between the current and baseline values.
Throughput	Data transfer rate.
Coverage Details	A list of the coverage details by power step.
RM Assisted Configuration	Click <b>RM Assisted Configuration</b> to run the RM Assisted Configuration feature.

**Step 5** To clear a radio performance fault, see [Clearing Summary Table Faults, page 3-9](#).

## Healing Your Network

When the Radio Manager detects the loss or recovery of an AP radio, it can attempt to compensate for that change by adjusting the power levels of the neighboring APs. The following topics describe how and where to use the Radio Manager Self Healing feature:

- [Understanding Self Healing, page 13-17](#)
- [Guidelines for Healing Your Network, page 13-21](#)
- [Running Self Healing, page 13-23](#)
- [Managing Self Healing Faults, page 13-25](#)

# Understanding Self Healing

## How It Works

Self Healing runs on the WLSE and uses SNMP to adjust neighboring APs in response to the loss or recovery of a radio. Self Healing performs two functions:

- Monitoring—Detecting a downed radio.
- Compensation—Modifying neighbor radios in response to a downed radio or a radio that has just come back up.

## How Monitoring Works

Self Healing monitoring uses path loss data (collected from AP Radio Scan and Radio Monitoring) and WDS registration information to determine a set of radio links for monitoring purposes. It uses this data to periodically check for any new radios or the loss of a radio.

Self Healing monitoring:

- Is enabled *per floor*.
- Requires that *all* radios on the monitored floor enable Radio Monitoring (to produce beacon reports).
- Considers a radio to be stale (down) if its beacons can reliably be heard by at least one other radio in the *same building* and no radio has reported hearing a beacon in 30 minutes. (In this case, off-building and off-site radios are not included because the number of radios to check during every monitoring pass could become too large and cause significantly slower response times.)

The loss of a radio can be due to:

- Radio transmission failure—Every hour Self Healing polls the beacon information obtained using WLCCP via the WDS(s), and triggers an event when a radio has failed to transmit for 30 minutes or more.
- WDS deregistration—Self Healing immediately triggers an event when a radio powers down (if the radio was not administratively shut down).
- Radar avoidance— When radar is detected on the current channel and the radio is in a DFS domain, Self Healing immediately triggers an event and changes the channel on that radio (see [Compensating for Radar](#), below).



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**Note** If an asynchronous event (radar avoidance or WDS deregistration) occurs between the hourly monitoring runs, the output of the event is added to the end of the log of the last polled run.

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### How Compensation Works

When a radio is detected as down (or back up), Self Healing compensation uses *any neighboring radio* (including off-building and off-site radios) to compensate for the potential areas of lost coverage.



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**Note** In this case, a *neighboring radio* is any radio that might have heard the downed/upped radio's beacon at any time—especially during an AP Radio Scan, where the Radio Manager tries all the channels and powers to determine who can listen to whom. This type of neighbor is determined by beacon detections over the air, not physical placement.

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Using the information previously gathered from AP Radio Scans and Radio Monitoring, the Radio Manager adjusts the transmit power levels of neighboring APs (which might or might not be on the same floor as the failed AP) to cover the potential areas of lost coverage, then generates a Self Healing fault.

It is possible that Self Healing might *decrease* the transmit power of some neighboring APs. When a radio is detected as down, Self Healing computes the best coverage possible given the available radios and current channel settings. In response to a downed radio, Self Healing only changes the power setting—it does not change the channel. Given these constraints, the power for some radios is turned down while the power for others is turned up to ensure the best coverage.



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**Note** Self Healing modifies the power setting only—not the channel frequency or beacon interval—of the neighboring APs.

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Self healing is *not triggered* under the following conditions:

- When you are adjusting your network and you administratively shut down an AP's radio. Because this is an administrator-controlled operation, WLSE does not perform self healing on the network. In this case, when the device is re-enabled, all APs will still retain their original settings.
- When you are adjusting the power settings or channel settings.

- If an AP has an enabled hot-standby AP. In the event of a failure and the hot-standby takes over, Self Healing will monitor the hot-standby AP.
- If the AP radio avoids radar by selecting a channel that is not in a DFS domain (see [Compensating for Radar](#), below).

### Data Produced

When Self Healing detects a network failure, a series of faults are generated (see [Managing Self Healing Faults](#), page 13-25). Self healing faults have three states:

- Detection—Self Healing has determined that the network requires healing.
- Compensation determination—Self Healing is running Assisted Configuration (RPG—the radio parameter generation process).
- Reason—The status of the Self Healing run:
  - Error: Compensation calculation did not complete due to unrecoverable errors.
  - Incomplete: Compensation finished with errors.
  - Timeout: Compensation did not complete due to time-out (30 minutes).
  - CompensatedDown: Appeared Up/Down: Compensated for by up or down radio(s).
  - CompensatedUp: Appeared Up/Down: Compensated for by up or down radio(s).

### Specifying Backup WDSs For Self Healing

The WDS provides WLSE with the data it needs to determine if a radio is up. If all the WDS devices configured for the APs on a floor are down (non-operational), Self Healing might try to heal those APs due to the missing data. Therefore, all the APs on a floor configured with Self Healing should be registered with WDSs that have at least one standby.



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**Note** A fault is triggered when Radio Monitoring is not enabled for a radio, when the WDS is not registered, or when the WDS has lost connectivity to the WLSE.

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If you have self healing enabled, it is *highly recommended* that you specify one or more backup WDS devices:

- Any AP or WDS router can be used as a backup WDS.
- You can have more than one backup, and your backups can have backups.
- You can configure HRSP on a second WLSM, which will then function as a standby WDS for your primary WLSM-WDS device.

For more information about WDS devices, see [What is WDS and Why Do I Need It?](#), page 12-9.

### Hot Standby and Self-Healing

Hot Standby lets you keep a redundant standby AP set for a primary AP. Then, if the primary AP goes down, the standby will take over—presumably, with the same or similar settings—to allow for no loss in coverage.

With Self Healing, the WLSE monitors the wireless network and if it determines a radio is down, it modifies the power settings of neighboring APs in an attempt to maintain the coverage.

If both Hot Standby and Self Healing are deployed, Hot Standby takes precedence over Self Healing. In this case, Self Healing does not modify the neighboring APs unless the standby becomes the primary AP *and* that AP goes down as well (a double failure).

### Compensating for Radar

An AP radio that is in a DFS (Dynamic Frequency Selection) domain will change channels when radar is detected on the current channel.

- If the AP radio changes from the current radar detected channel to another DFS channel, the radio must wait one minute before operating on the new channel (if the channel is clear of radar).

During a simulation, if the channel change occurs immediately (that is, there is no one minute delay), self healing is not triggered. This is expected behavior because there is no interruption.

- If the AP changes channels from a DFS channel that is detecting radar to a channel that is not in the DFS regulatory domain (a non-DFS channel), the one minute delay does not occur and the AP radio will change channels immediately.

This type of change does not cause any loss in coverage and therefore does not warrant self healing, but may leave the floor in a sub optimal state. In this case, Auto Resite Survey is designed to monitor the performance of a floor and should be used to detect any path loss.

## Guidelines for Healing Your Network

### Prerequisites

Before you run Self Healing, you must:

1. Configure your network for radio management (see [Getting Started with Radio Manager](#), page 13-2).



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**Note** Before you enable self healing, you must specify one or more backup AP-WDSs or a single standby WLSM-WDS (see [What is WDS and Why Do I Need It?](#), page 12-9).

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2. Define the location elements (buildings and floors) and place the APs on the floor images. For more information, see:
  - [Entering Building Information](#), page 14-4
  - [Adding Floors to Location Manager](#), page 14-11
  - [Adding Devices to Floors](#), page 14-18
3. Perform an AP Radio Scan on all APs on the specified floor (see [Using AP Radio Scans to Collect RM Data](#), page 14-58).
4. At a minimum, enable Radio Monitoring on *all APs* (for both serving and non-serving channels) on the specified floor.



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**Note** You will get better results if Radio Monitoring is enabled on all APs on all floors within range of the radios you want to monitor.

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Radio Monitoring is enabled by default; if it has been disabled, you must re-enable it (see [Using Radio Monitoring to Collect RM Data](#), page 13-2).

5. Ensure that the WLSE has properly authenticated and has connectivity to the WDSs for all APs on the floor to be monitored. To verify this, you can run the RM Capability Verifier in the Location Manager (see [Verifying Radio Management Capability, page 14-35](#)).

### Tips

- To enable Self Healing monitoring:
  1. Select the buildings and floors for which self healing will be enabled and assign the self healing settings (see [Running Self Healing, page 13-23](#)).
  2. View the faults that are generated when self healing is activated (see [Managing Self Healing Faults, page 13-25](#)).




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**Note**

Self Healing faults are *always enabled*. When you set up Self Healing for a floor, you will always receive fault notifications when a network disruption occurs.

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**Note**

The fault RF Port AdminStatus is enabled by default and must remain enabled with a default polling time of 5 minutes (see [Setting RF Port AdminStatus Threshold, page 3-55](#)). Self healing ignores any radio set as administratively down, but this can only be detected if fault polling is enabled.

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3. After the self healing process is complete, locate the failed interfaces and the AP interfaces that were modified to replace them (see [Running Self Healing, page 13-23](#)).
- Self Healing modifies the power setting only—not the channel frequency or beacon interval—of the neighboring APs. Because Self Healing can change APs on different floors (or buildings) from the failed AP but must do so without changing the channel frequency, the network might be operating in a sub-optimal manner. To resolve this problem, enable Auto Re-Site Survey (see [Evaluating AP Radio Performance, page 13-9](#)) and/or Self-Healing on the surrounding floors.
  - If an AP has a hot-standby enabled, it is *not* monitored by Self Healing. In the event of a failure and the hot-standby takes over, Self Healing will monitor the hot-standby AP.

- If you have self healing enabled, you must specify one or more backup WDS devices.

#### Related Topics

- [Understanding Self Healing, page 13-17](#)

## Running Self Healing

#### Typical Scenarios and FAQs

- How do I specify which floors will run self healing?
- I want to set the severity of a self healing notification.
- How do I specify whether the changes to neighboring APs are to be applied automatically or manually?
- I want to view the current self healing faults for a [P1...P5] setting.
- How can I monitor the progress of a self healing job?



#### Note

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Your login determines whether you can use this option.

---

#### Before You Begin

Satisfy the Self Healing prerequisites (see [Guidelines for Healing Your Network, page 13-21](#)).

#### Procedure

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- Step 1** Select **Radio Mgr > Self Healing**. The Review Current form appears displaying the floors currently selected for Self Healing.
- Step 2** From the menu in the left pane, click **Select Floors** and select a building from the Buildings list. The floors for the selected building appear in the Available Floors list.
- Step 3** Select a floor and click the right arrows ( >> ) to add it to the Selected Floors list.  
Now that you have selected your self healing options, you need to save your settings.
- Step 4** From the menu in the left pane, click **Finish**.

**Step 5** Select the severity level to assign to the fault when a self healing fault is triggered.

**Step 6** You can choose to automatically apply changes to neighboring APs:

- When automatic self healing is enabled, neighboring APs are adjusted to accommodate the loss of coverage.
- When automatic self healing is disabled, the changes to neighboring APs must be applied from the Faults Display Details page for each fault occurrence.

**Step 7** Click **Save**. A new window displays the buildings and floors on which Self Healing is enabled. Close this window to view the **Review Current** screen.

**Step 8** To view the log generated by the self healing process, select the run and click **Self Healing Run Log** (located below the list of buildings and floors).

The Self Healing Run Log table appears in a separate browser window. This table contains the following information for each run:

Field	Description
Select Run	Click this button to see the details for that run.  The details for the selected job run appear below the list of runs for that job.
Start Time	The time the job started.
End Time	The time the job ended.

The Self Healing run log for the selected run appears below this table. To view the details for a different run, select another run from the table and click **Self Healing Run Log**.

Self Healing creates a log file for each run. To be certain you are looking at the latest information, click the **Refresh** button to refresh the job list.



**Note** If an asynchronous event (radar avoidance or WDS deregistration) occurs between the hourly monitoring runs, the output of the event is added to the end of the log of the last polled run.

**Step 9** To view more details about the fault that is generated while Self Healing is in progress, see [Managing Self Healing Faults, page 13-25](#).

- Step 10** Because Self Healing can choose an AP on a different floor or building from the failed AP to cover any holes in coverage, you should enable Auto Re-Site Survey to monitor performance of your APs (see [Evaluating AP Radio Performance, page 13-9](#)).
- 

**Related Topic**

- [Understanding Self Healing, page 13-17](#)
- [Managing Self Healing Faults, page 13-25](#)

## Managing Self Healing Faults

To manage the self healing faults in your network, use **Faults > Display Faults**. Or, to see only those faults pertaining to Self Healing, select **Radio Mgr > Self Healing**.

**Typical Scenarios and FAQs**

- Why was self healing initiated?
- I have just been notified that self healing has been initiated. How do I track its progress?
- I have just been notified that self healing has been initiated. How do I display a list of the failed interfaces and the neighboring AP interfaces that were modified to replace them?
- How do I review the history of self healing actions in my network?
- The self healing process on my network is complete. How can I view the new power settings? How do I clear the faults associated with this process?

**Note**

Your login determines whether you can use this option.

---

**Before You Begin**

- Satisfy the prerequisites for running self healing (see [Guidelines for Healing Your Network, page 13-21](#)).
- Select the buildings and floors for which self healing will be enabled and assign the self healing settings (see [Running Self Healing, page 13-23](#)).

## Procedure

- Step 1** To display the Self Healing faults, you can:
- Display the general Fault Summary screen:
    - Select **Faults > Display Faults**. The Faults Summary screen appears.
    - Select the filtering criteria to display any self healing faults.
  - Display only active Self Healing faults:
    - Select **Radio Mgr > Self Healing**. The Review Current screen appears.
    - Select **View Active Faults**. The active Self Healing faults are displayed in a new window.
- Step 2** To display the Fault Details window, select the Description or Timestamp field for a fault.
- Step 3** To view the results of Self Healing compensation calculations, click the icon (a note pad with glasses) between the Description and Timestamp columns in the Fault Detail Conditions table. A new window displays the following information:

**Table 13-4 Self Healing Compensation Results**

Column	Description
Faults Details (first row)	See <a href="#">Device Fault Details, page 3-11</a>
Failed Interface	MAC address of the failed radio.
Modified Interface/ Message	The IP address, MAC address, and radio interface type of the AP that has been modified to compensate for the failed radio.
Old OFDM(11g) Power	Previous <b>OFDM</b> (Orthogonal Frequency Division Multiplexing) setting on the modified AP (11g radios only).
New OFDM(11g) Power	New <b>OFDM</b> setting on the modified AP (11g radios only).

**Table 13-4 Self Healing Compensation Results**

Column	Description
Old CCK/Tx Power	Previous setting on the modified AP. Contains: <ul style="list-style-type: none"> <li>For 11b and 11g radios: <a href="#">CCK</a> (Complementary Code Keying) value</li> <li>For 11a radios: Tx value</li> </ul>
New CCK/Tx Power	New setting on the modified AP. Contains: <ul style="list-style-type: none"> <li>For 11b and 11g radios: <a href="#">CCK</a> (Complementary Code Keying) value</li> <li>For 11a radios: Tx value</li> </ul>



**Note** If an asynchronous event (radar avoidance or WDS deregistration) occurs between the monitoring runs, the output of the event is added to the end of the log of the last polled run.

- Step 4** When automatic self healing is disabled, the changes to neighboring APs must be applied from this page for each fault occurrence. To apply the new settings, click **Apply Changes Now**.
- Step 5** To see the changes immediately and graphically in Location Manager, run an inventory for the affected APs. This will show the new coverage details for the adjusted APs as well as the previous coverage for the downed AP (see [Managing Your WLAN Radio Environment by Sites](#), page 14-1).
- Step 6** To determine why Self Healing was run, check the fault history log (see [Running Self Healing](#), page 13-23).
- Step 7** To clear a self healing fault, see [Clearing Summary Table Faults](#), page 3-9.

#### Related Topics

- [Understanding Self Healing](#), page 13-17
- [Displaying Radio Manager Reports](#), page 13-37

# Using Frame Monitoring

Frame Monitoring allows you to perform network troubleshooting and intrusion detection and send this information to a third-party server for further analysis. The following sections will help you understand how to use Frame Monitoring:

- [Understanding Frame Monitoring, page 13-28](#)
- [Guidelines for Using Frame Monitoring, page 13-29](#)
- [Configuring Frame Monitoring, page 13-30](#)
- [Displaying Frame Monitoring APs, page 13-34](#)
- [Disabling Frame Monitoring on Selected APs, page 13-36](#)

## Understanding Frame Monitoring

### How It Works

You can use the WLSE Frame Monitoring feature:

- To configure Frame Monitoring. Upon receiving a request to enable Frame Monitoring, an AP in scanning-only mode will:
  - a. Abort all its current operations and schedule Frame Monitoring jobs as directed by the given parameters.
  - b. Start Frame Monitoring on the channel that it was programmed to use on its radios and send the frames to the external UDP end point. If the default parameters were used (the configuration was done using the CLI or WLSE user interface), the AP will continuously monitor the channels it was currently scanning.
- To review Frame Monitoring results. The Review Current screen displays information about the APs that are performing Frame Monitoring tasks (see [Displaying Frame Monitoring APs, page 13-34](#)).

# Guidelines for Using Frame Monitoring

## Prerequisites

To use Frame Monitoring, you must:

1. Set up a third-party server to analyze the data collected by Frame Monitoring.
2. Configure your network for radio management (see [Getting Started with Radio Manager, page 13-2](#)).
3. Verify that the access points you have selected to perform Frame Monitoring are scanning-only APs (select **Reports > Device Center > Scanning AP**). If the APs are not in this list, re-run the inventory process.



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**Note** Only scanning-only APs can perform Frame Monitoring.

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4. Enable monitor mode on selected APs (see [Configuring Frame Monitoring, page 13-30](#)).

## Tips

- To remove APs that are already configured to run Frame Monitoring, see [Disabling Frame Monitoring on Selected APs, page 13-36](#).
- When an AP that is running in monitor mode receives a message to disable monitor mode, it aborts its Frame Monitoring tasks and resumes its previous scanning job.
- The scan duration time is set to 100ms and cannot be changed using the WLSE user interface.
- For maximum flexibility, use the XML APIs to configure Frame Monitoring. The WLSE user interface can always be used to check the status of Frame Monitoring.



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**Note** If you are using a third-party system to configure Frame Monitoring via the XML APIs, *do not* use the WLSE interface to perform any configuration tasks.

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- Only access points in scanning-only mode can be configured to monitor mode.

- After monitor mode has been enabled on an access point, that access point is considered to be a dedicated frame monitor until you explicitly disable monitor mode.
- If monitor mode is enabled on an AP that is running Radio Monitoring, Radio Monitoring is automatically disabled.



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**Note** Any AP you select will perform Frame Monitoring indefinitely until you explicitly disable monitor mode on that AP.

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- Although on dual-mode APs you can use the CLI to enable monitor mode on just one interface, this approach is *not officially supported* because the stress on the AP will result in dropped client associations.

## Configuring Frame Monitoring

You can use the WLSE user interface to enable and disable Frame Monitoring operations and to assign Frame Monitoring configuration settings.

**Note**

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Using the WLSE user interface, the Frame Monitoring scanning pattern is fixed and cannot be changed. For maximum flexibility, consider using the XML APIs to configure Frame Monitoring instead, and using the WLSE interface for ongoing monitoring tasks.

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**Caution**

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If you are using a third-party system to configure Frame Monitoring via the XML APIs, *do not* use the WLSE interface to perform any configuration tasks.

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### Typical Scenarios and FAQs

- How do I set up selected access points to run Frame Monitoring?



**Note** Your login determines whether you can use this option.

### Before You Begin

Satisfy the Frame Monitoring prerequisites (see [Guidelines for Using Frame Monitoring, page 13-29](#)).

### Procedure

- Step 1** Select **Radio Mgr > Frame Monitoring**. The Frame Monitoring screen appears.
- Step 2** The Review Current screen displays the APs that are currently performing Frame Monitoring tasks (see [Displaying Frame Monitoring APs, page 13-34](#)).
- Step 3** To assign the Frame Monitoring settings, select **Configuration** from the menu in the left pane.
- Step 4** Complete the following:

Field	Description
Enable/Disable	<p>Click to enable or disable Frame Monitoring:</p> <ul style="list-style-type: none"> <li>• Enable: Select this option to enable monitor mode and enter the Frame Monitoring configuration settings.</li> <li>• Disable: Select this option to <i>cancel</i> Frame Monitoring.               <ul style="list-style-type: none"> <li>– For scanning only APs, selecting Disable will cancel monitor mode operations on the selected APs.</li> <li>– For normal APs, selecting Disable will remove the selected APs from the Review Current screen only if the AP was a scanning-only AP and was previously performing Frame Monitoring operations.</li> </ul> </li> </ul> <p><b>Note</b> Verify the values in the other fields to make sure you are disabling monitor mode for the correct end point.</p>

Field	Description
End Point IP Address	The IP address of the external third party end point to which the frames are to be sent.  <b>Note</b> This field is restricted to numeric IPV4 addresses.  <b>Note</b> The WLSE does not perform any validation on this IP address. You are responsible for ensuring that this field contains the correct end point IP address.
End Point Port Number	The UDP port number of the external third party end point to which the frames are to be sent. Default = 1024.
Frame Truncation	Frame truncation length (in bytes). Default = 128 bytes.

**Step 5** Choose **Select Scanning AP** from the menu in the left pane.

**Step 6** Select the scanning-only APs on which you want to enable or disable monitor mode (see [Using the Device Selector, page 1-17](#)).

- For *scanning only* APs, selecting Disable will cancel Frame Monitoring operations on the selected APs.
- For *normal* APs, selecting Disable will remove the selected APs from the Review Current screen only if the AP was a scanning-only AP and was previously performing Frame Monitoring operations.

**Step 7** Choose **Select Radio Type** from the menu in the left pane.

**Step 8** Select the types of 802.11 radios that will run Frame Monitoring (default = all radio types).



**Note** Only radios of the selected types will perform Frame Monitoring. If a selected AP has no interfaces of the desired radio types, this is noted in the Job Run Log.



**Note** All radio interfaces on an access point must be in scanning-only mode. The WLSE cannot enable monitor mode on an AP that has an interface that is not in scanning-only mode (see [Guidelines for Using Frame Monitoring, page 13-29](#)).

**Step 9** To save your settings, select **Finish** from the menu in the left pane. The Finish dialog appears.

**Step 10** Click **Save** to save the Frame Monitoring configuration settings.



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**Note** If a warning message appears saying that WLSE server is ahead of or behind your local time, see [Understanding Time Discrepancy Problems in Job Scheduling, page 1-16](#).

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There are three possible results:

- An error message is displayed if there is no configuration (IP address and port number), no selected AP, or the selected AP is not a scanning-only AP. No further action can be taken until the problem is resolved.
- A warning message is displayed if monitor mode is disabled or no truncation value has been entered. Upon confirmation, the save process will continue.
- A summary displays the settings that have been saved. You can refresh the Review Current page to see the saved settings.

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#### Related Topics

- [Displaying Frame Monitoring APs, page 13-34](#)
- [Disabling Frame Monitoring on Selected APs, page 13-36](#)
- [Guidelines for Using Frame Monitoring, page 13-29](#)

## Displaying Frame Monitoring APs

You can use **Radio Mgr > Frame Monitoring** to display the scanning-only APs that are performing frame monitoring.

### Typical Scenarios and FAQs

- How do I view the access points that are running Frame Monitoring?



#### Note

Your login determines whether you can use this option.

### Before You Begin

Satisfy the Frame Monitoring prerequisites (see [Guidelines for Using Frame Monitoring, page 13-29](#)).

### Procedure

- Step 1** Select **Radio Mgr > Frame Monitoring**. The Review Current screen displays the following information about the APs that are currently performing Frame Monitoring tasks:

**Table 13-5** *Current Frame Monitoring Details*

Column	Description
AP Name	The IP address of the access point that is currently performing Frame Monitoring tasks.
Channel	<p>The channel that is being monitored.</p> <p>The channels that are used depend on the radio type:</p> <ul style="list-style-type: none"> <li>• 11b/11g radios use channels 1 through 14.</li> <li>• 11a radios use channels 36, 40, 44, 48, 52, 60, 64, 149, 153, 157, and 161.</li> </ul> <p><b>Note</b> Not all channels will be used for all regulatory domains.</p>
PHY	The physical interface type (11a, 11b, or 11g) that is currently performing Frame Monitoring tasks.

**Table 13-5 Current Frame Monitoring Details (continued)**

Column	Description
End Point IP Address	The IP address of the external third party end point to which the frames are currently being sent.
End Point Port Number	The port number of the external third party end point to which the frames are currently being sent.
Frame Truncation	The number of bytes you want to see: <ul style="list-style-type: none"> <li>• Default = 128 bytes</li> <li>• Minimum = 24 bytes of MAC header</li> <li>• Maximum = MTU on the radio</li> </ul>
Status	The Frame Monitoring configuration setting status. Possible values: <ul style="list-style-type: none"> <li>• pending—The initial status when the configuration setting is being saved in the database.</li> <li>• running—The WLSE is sending the configuration to the WDS.</li> <li>• success—The WDS has received the configuration and set up the scanning AP.</li> </ul>

**Related Topics**

- [Configuring Frame Monitoring, page 13-30](#)
- [Disabling Frame Monitoring on Selected APs, page 13-36](#)
- [Guidelines for Using Frame Monitoring, page 13-29](#)

## Disabling Frame Monitoring on Selected APs

You can use **Radio Mgr > Frame Monitoring** to remove APs from the list of APs that are configured to run Frame Monitoring.

### Typical Scenarios and FAQs

- How do I disable Frame Monitoring on an access point?



#### Note

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Your login determines whether you can use this option.

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### Before You Begin

- Satisfy the Frame Monitoring prerequisites (see [Guidelines for Using Frame Monitoring, page 13-29](#)).
- There must be at least one AP running Frame Monitoring.

### Procedure

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- Step 1** Select **Radio Mgr > Frame Monitoring**. The Review Current screen displays the APs that are currently performing Frame Monitoring tasks.
- Step 2** Select **Configuration** from the menu, then click **Disable** (you want to *disable* Frame Monitoring on selected APs).
- Step 3** Choose **Select Scanning AP** from the menu, then add the APs you want to remove to the Selected Devices list.
- Step 4** Choose **Select Radio Type** and select the radio type (or select both 11a and 11b/11g if you are not sure).
- Step 5** Select **Finish** to save the setting.

The Frame Monitoring operation on the selected APs will be canceled and they will be removed from the Currently Monitoring list.

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### Related Topics

- [Guidelines for Using Frame Monitoring, page 13-29](#)

- [Configuring Frame Monitoring, page 13-30](#)
- [Displaying Frame Monitoring APs, page 13-34](#)

## Displaying Radio Manager Reports

The Radio Manager reports allow you to view radio management information. You can view, export, and email the following report types:

- Configured Radio Parameters Report
- Path Loss Between Managed APs Report
- Path Loss Historical Report
- Channel Loading Report
- Channel Loading Historical Report
- Radar Detection Report
- Radar Detection Historical Report

For more information about these reports, see [Displaying Radio Manager Reports, page 11-19](#).

