CHAPTER 6

Monitoring Maps

This chapter describes how to add maps to the Cisco NCS database and use them to monitor your LAN. With the NCS database, you can add maps and view your managed system on realistic campus, building, and floor maps.

Note Additionally, you can enable location presence by mobility server to provide expanded Civic (city, state, postal code, country) and GEO (longitude, latitude) location information beyond the Cisco default setting (campus, building, floor, and X, Y coordinates). This information can then be requested by clients on a demand basis for use by location-based services and applications. Location presence can be configured when a new campus, building, floor, or outdoor area is being added or configured at a later date.

Note A mobility server should be synchronized before location presence is enabled. For details on enabling location presence and assigning its parameters, see the *Cisco Context-Aware Services documentation*. This configuration guide also covers verifying location accuracy, using chokepoints, using Wi-FI TDOA receivers, applying calibration models, and other context-aware planning and verification topics.

This chapter contains the following sections:

Information About Maps

This section contains the following topics:

Maps

Maps provide a summary view of all your managed systems on campuses, buildings, outdoor areas, and floors. The available information includes the following:

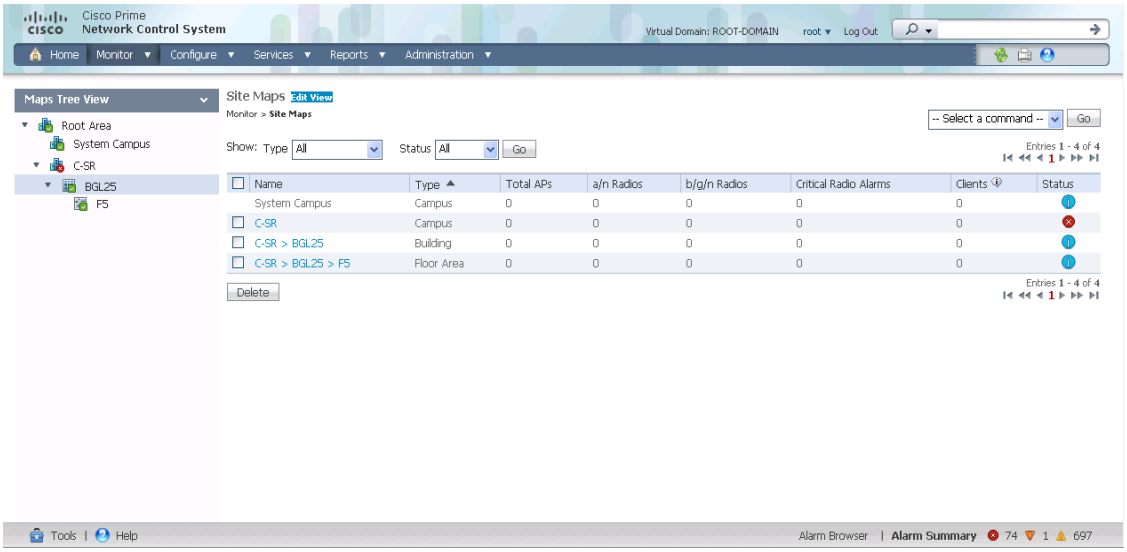
- Total APs—Number of total access points for each map.
- 802.11a/n Radios and 802.11b/g/n Radios—Number of 802.11a/n and 802.11b/g/n radios associated with each map.
- Out of Service (OOS) Radios—Number of 802.11a/n and 802.11b/g/n radios associated with each map.
- Clients—Number of clients associated to access points on the map.
- AP Heat Maps—A real-time wireless RF graphical representation of data which shows RF coverage throughout a facility or campus through the use of a heat map. For more information on Heat APs see the "Understanding RF Heatmap Calculation" section on page 6-110.

Note This number is based on the most recent client statistics poll. The number of clients located on the map by MSE might not match this number.

- 802.11a/n and 802.11b/g/n Avg Air Quality—Indicates the average Air Quality (AQ) for 802.11a/n and 802.11b.g.n radios.
- 802.11a/n and 802.11b/g/n Min Air Quality—Indicates the minimum Air Quality (AQ) for 802.11a/n and 802.11b/g/n radios.
- Status—Indicates the current status of the map.
  - Red circle—Critical fault
  - Yellow triangle—Minor fault
  - Green square—Ok

Note To view or edit current maps, choose **Monitor > Site Maps** (see Figure 6-1), and choose the appropriate map from the list. Use the Select a command drop-down list to access additional functionality.

Figure 6-1 Site Maps Page



The left sidebar menu lists all campuses, buildings, and floors in a tree view. When you click a campus, building, or floor in the Maps Tree View menu, the main area of the page displays corresponding information.

Note Click **Edit View** to change the information displayed for the listed maps. See the "Configuring Edit View" section on page 6-9 for more information.

Note The Root area (listed in the Maps Tree View menu) displays a list of buildings that are not in campuses. Status and object counts for root area buildings are not aggregated.

Use the Select a command drop-down list for additional map functionality.

Campus

A campus is the area in which a building, an outdoor area, or set of surrounding buildings are situated.

Building

A structure that has a roof and walls and stands more or less permanently in one place.

Floor Area

The floor area is the area of each floor of the building measured to the outer surface of the outer walls including the area of lobbies, cellars, elevator shafts, and in multi-dwelling buildings, all the common spaces.

Outdoor Area

An area that includes a building or set of buildings, or could be just plain land that is not an indoor area.

Access Points

Access points (APs) are specially configured nodes on wireless local area networks (WLANs). Access points act as a central transmitter and receiver of WLAN radio signals. Access points support Wi-Fi wireless communication standards.

Chokepoints

Installation of chokepoints provides enhanced location information for RFID tags. When an active Cisco Compatible Extensions version 1 compliant RFID tag enters the range of a chokepoint, it is stimulated by the chokepoint. The MAC address of this chokepoint is then included in the next beacon sent by the stimulated tag. All access points that detect this tag beacon then forward the information to the controller and location appliance. See the "Configuring ChokePoints" section on page 6-58 for more information.

Wi-Fi TDOA Receivers

TDOA technology uses a time-based method to calculate the location. Each Wi-Fi TDOA receivers report the time of arrival of the signal from the tag to its respective receiver. The mobility services engine correlates the time of arrival for all the tag signals from all the TDOA receivers to find the intersection points of known distances. The greater the number of receivers used in the calculation, the more accurately the tag can be located. Wi-Fi TDOA receivers are typically used for calculating location information in manufacturing or retail warehouse environments (where there are lots of machines or high ceilings or both), in outdoor environments, or in other line-of-site environments. See the "Configuring Wi-Fi TDOA Receivers" section on page 6-61 for more information.

Map Editor

You can use the NCS map editor to define, draw, and enhance floor plan information. The map editor enables you to create obstacles to consider when you compute RF prediction heat maps for access points. You can also add coverage areas for MSEs that locate clients and tags in that particular area.

With the map editor, you can perform the following functions:

- Save—Saves the current map image.
- Recompute prediction—Updates the RF prediction heatmap if any changes are made to the existing floor map image.
- Reload Last Saved—Loads the last saved map image.
- Select all—Selects all the obstacles and coverage areas that you have created.
- Unselect—Deselects the obstacles and coverage areas that are selected.
- Move selected Obstacles—Moves the selected obstacles to a different location on the map.
- Duplicate selected Obstacles—Creates a copy of the selected obstacles.
- Zoom in/Zoom out—Zoom in or out on the image you are currently viewing.

- Show floor image—Use this to display the floor image.
- Show obstacles—Use this to display the obstacles.
- Larger resolution/Medium resolution/Smaller resolution—Increase or decrease the resolution of the floor map image.
- SNAP Mode—Use this to snap an obstacle to its nearest obstacle while drawing.
- ORTHO Mode—Use to draw a horizontal or vertical obstacle. This is especially useful when you want to draw all the obstacles at right angles.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature and contains the following topics:

- Guidelines for Using the Map Editor, page 6-5
- Guidelines for Placing Access Points, page 6-5
- Guidelines for Inclusion and Exclusion Areas on a Floor, page 6-7

Guidelines for Using the Map Editor

Consider the following when modifying a building or floor map using the map editor:

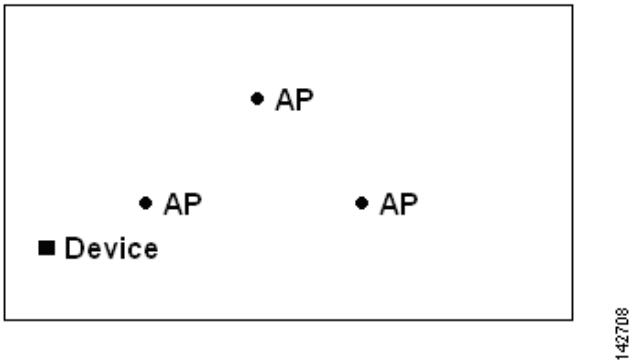
- We recommend that you use the map editor to draw walls and other obstacles rather than importing an .FPE file from the legacy floor plan editor.
  - If necessary, you can still import .FPE files. To do so, navigate to the desired floor area, choose **Edit Floor Area** from the Select a command drop-down list, click **Go**, select the **FPE File** check box, and browse to choose the .FPE file.
- You can add any number of walls to a floor plan with the map editor; however, the processing power and memory of a client workstation might limit the refresh and rendering aspects of the NCS.
  - We recommend a practical limit of 400 walls per floor for machines with 1GB RAM or less.
- All walls are used by the NCS when generating RF coverage heatmaps.
  - However, the MSEs use no more than 50 heavy walls in its calculations, and the MSE does not use light walls in its calculations because those attenuations are already accounted for during the calibration process.

If you have a high resolution image (near 12 megapixels), you might need to scale down the image resolution with an image editing software prior to using map editor.

Guidelines for Placing Access Points

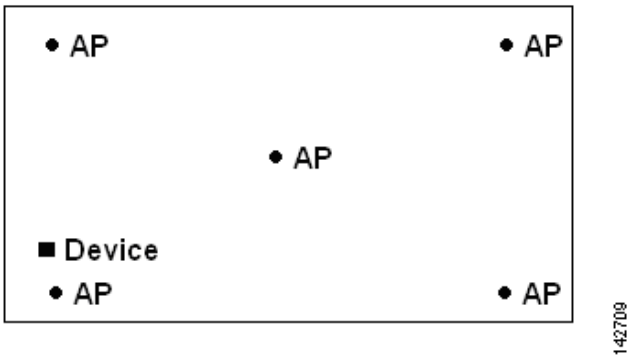
Place access points along the periphery of coverage areas to keep devices close to the exterior of rooms and buildings (see Figure 6-2). Access points placed in the center of these coverage areas provide good data on devices that would otherwise appear equidistant from all other access points.

Figure 6-2 Access Points Clustered Together



By increasing overall access point density and moving access points towards the perimeter of the coverage area, location accuracy is greatly improved (see Figure 6-3).

Figure 6-3 Improved Location Accuracy by Increasing Density



In long and narrow coverage areas, avoid placing access points in a straight line (see Figure 6-4). Stagger them so that each access point is more likely to provide a unique snapshot of a device location.

Figure 6-4 Refrain From Straight Line Placement

Although the design in Figure 6-4 might provide enough access point density for high bandwidth applications, location suffers because each access point view of a single device is not varied enough; therefore, location is difficult to determine.

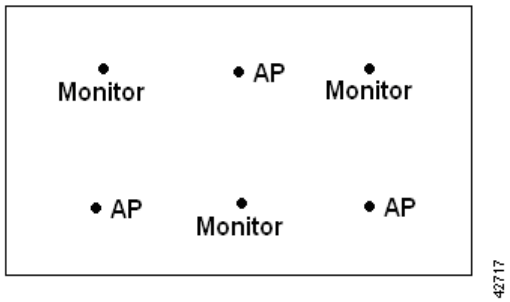
Move the access points to the perimeter of the coverage area and stagger them. Each has a greater likelihood of offering a distinctly different view of the device, resulting in higher location accuracy (see Figure 6-5).

Figure 6-5 Improved Location Accuracy by Staggering Around Perimeter

Most current wireless handsets support only 802.11b/n, which offers only three non-overlapping channels. Therefore, wireless LANs designed for telephony tend to be less dense than those planned to carry data. Also, when traffic is queued in the Platinum QoS bucket (typically reserved for voice and other latency-sensitive traffic), lightweight access points postpone their scanning functions that allow them to peak at other channels and collect, among other things, device location information. The user has the option to supplement the wireless LAN deployment with access points set to monitor-only mode. Access points that perform only monitoring functions do not provide service to clients and do not create any interference. They simply scan the airwaves for device information.

Less dense wireless LAN installations, such as voice networks, find their location accuracy greatly increased by the addition and proper placement of monitor access points (see Figure 6-6).

Figure 6-6 Less Dense Wireless LAN Installations



Verify coverage using a wireless laptop, handheld, or phone to ensure that no fewer than three access points are detected by the device. To verify client and asset tag location, ensure that the NCS reports client devices and tags within the specified accuracy range (10 m, 90%).

Note If you have a ceiling-mounted AP with an integrated omni-directional antenna, the antenna orientation does not really need to be set in the NCS. However, if you mount that same AP on the wall, you must set the antenna orientation to 90 degrees.

Guidelines for Inclusion and Exclusion Areas on a Floor

Inclusion and exclusion areas can be any polygon shape and must have at least three points.

You can only define one inclusion region on a floor. By default, an inclusion region is defined for each floor when it is added to the NCS. The inclusion region is indicated by a solid aqua line, and generally outlines the region.

You can define multiple exclusion regions on a floor.

Newly defined inclusion and exclusion regions appear on heatmaps only after the mobility services engine recalculates location.

Monitoring Maps

This section contains the following topics:

Configuring Maps

This section contains the following topics:

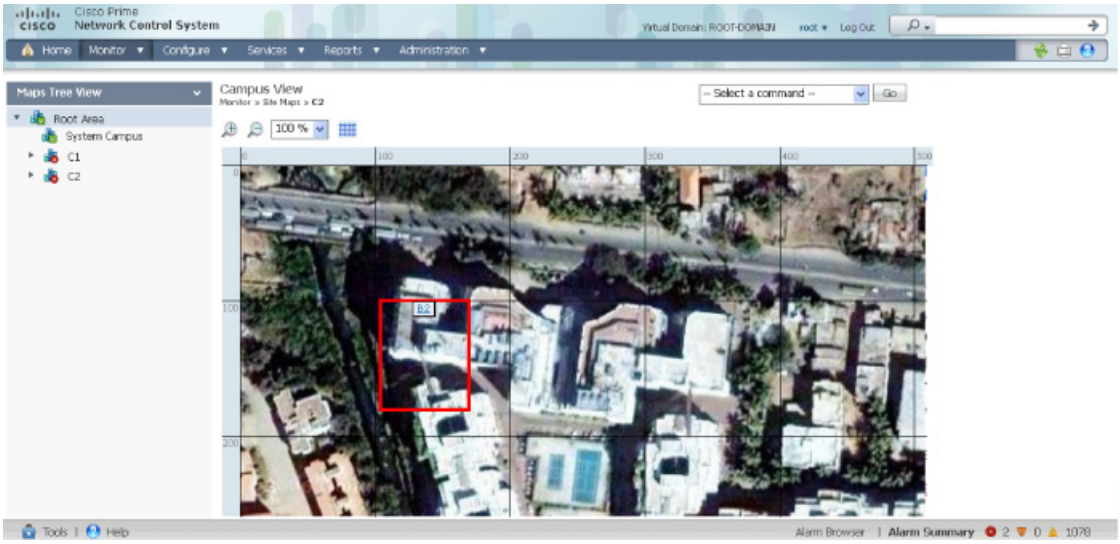
Viewing a Map

To view a current campus map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the campus map to view its details in the Campus View page (see Figure 6-7).

Figure 6-7 Campus View



Step 3 The Select a command drop-down list provides the following options:

- New Floor Area—See the "Adding Floor Areas to a Campus Building" section on page 6-28 for more information.
- Edit Building—See the "Editing a Map" section on page 6-10 for more information.
- Delete Building—See the "Deleting a Map" section on page 6-10 for more information.
- Copy Building—See the "Managing RF Calibration Models" section on page 6-64 for more information.
- Edit Location Presence Information—See the "Managing Location Presence Information" section on page 6-70 for more information.

Note Use the **Monitor > Site Maps > Campus View** main navigation bar at the top of the campus image to enlarge or decrease the size of the map view and to hide or show the map grid (which displays the map size in feet or meters).

Configuring Edit View

The Edit View page enables you to choose which columns appear in the maps list page.

Note Name and Type are fixed columns. They cannot be moved or hidden.

Column names appear in one of the following lists:

- Hide Information—Lists columns that do not appear in the table. The Hide button points to this list.
- View Information—Lists columns that do appear in the table. The Show button points to this list.

To display a column in a table, click it in the Hide Information list, then click **Show**. To remove a column from a table, click it in the View Information list, then click **Hide**. You can select more than one column by pressing the Shift or Control key.

To change the position of a column in the View Information list, click it, then click **Up** or **Down**. The higher a column is in the list, the farther left it appears in the table.

Edit View Command Buttons

The Edit View page contains the following command buttons:

- Reset—Sets the table to the default display.
- Show—Moves the highlighted columns from the Hide Information list to the View Information list.
- Hide—Moves the highlighted columns from the View Information list to the Hide Information list.
- Up—Moves the highlighted columns upward in the list (further to the left in the table).
- Down—Moves the highlighted columns downward in the list (further to the right in the table).
- Submit—Saves the changes to the table columns and return to the previous page.
- Cancel—Discards the changes to the table columns and return to the previous page.

Editing a Map

To edit a current campus map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the campus map to open its details page.

Step 3 From the Select a command drop-down list, choose **Edit Campus**.

Step 4 Make any necessary changes to the Campus Name and the Contact.

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps** and choose **Properties** from the Select a command drop-down list.

Step 5 Click **Next**.

Step 6 Make any additional changes to Maintain Aspect Ratio or Dimensions (feet).

Step 7 Click **OK**.

Note System Campus is part of all partitions. Also, you cannot edit or delete a system campus.

Deleting a Map

To delete a map, follow these steps:

Step 1 In the Monitor > Site Maps page, Select the check box(es) for the map(s) that you want to delete.

Step 2 Click **Delete** at the bottom of the map list or choose **Delete Maps** from the Select a command drop-down list, and click **Go**.

Step 3 Click **OK** to confirm the deletion.

Note Deleting a campus or building also deletes all of its container maps. The access points from all deleted maps are moved to an Unassigned state. System Campus can not be deleted, however buildings or floors in system campus can be modified.

Copying a Map

The following guidelines apply to the copying process:

- Only the child elements are copied to the new map.
- The selected map is copied to the current applicable partition.
- Overlapping areas are not checked when buildings are copied. You should edit these after copying the map for proper positioning.
- If the selected map is above ground, the first available floor above ground is used for the copy.
- If the selected map is a basement, the first available basement is used for the copy.
- The following are *not* copied:
  - Access points and their positioning coordinates.
  - Planning mode data.

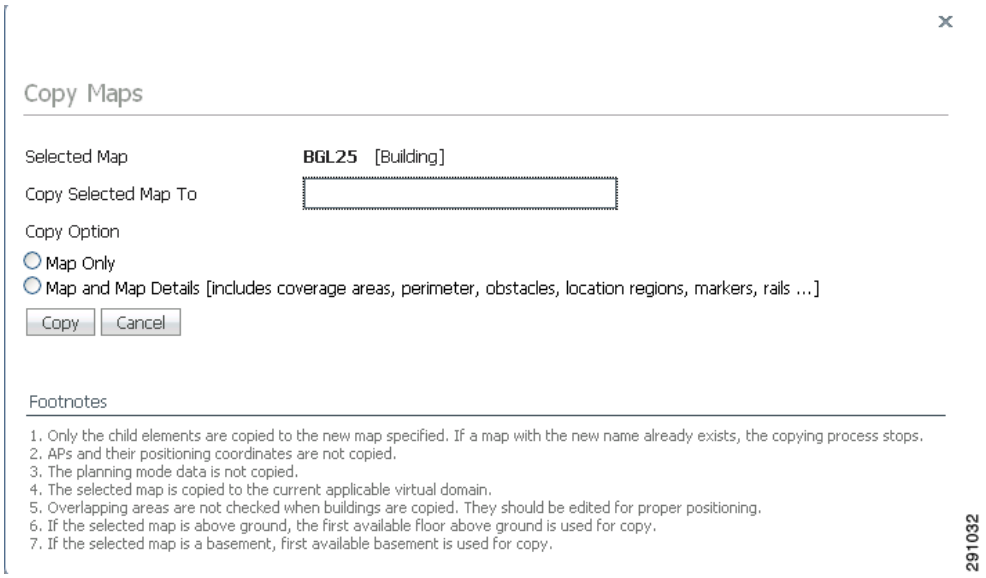
Note You cannot copy a System Campus.

To copy a map, follow these steps:

Step 1 In the Monitor > Site Maps page, select the check box of the map that you want to copy.

Step 2 From the Select a command drop-down list, choose **Copy Maps**. The Copy Maps dialog box appears (see Figure 6-8).

Figure 6-8 Copy Maps



Step 3 Enter the name of the new map to which you want to copy the current map.

Note If a map with the new name already exists, the copying process stops.

Step 4 Select the Copy Option (**Map Only** or **Map and Map Details**) radio button.

Note Map and Map Details includes coverage areas, perimeters, obstacles, location regions, markers, and rails.

Step 5 Click **Copy** to complete the copying process or **Cancel** to close the dialog box without copying the current map.

Exporting a Map

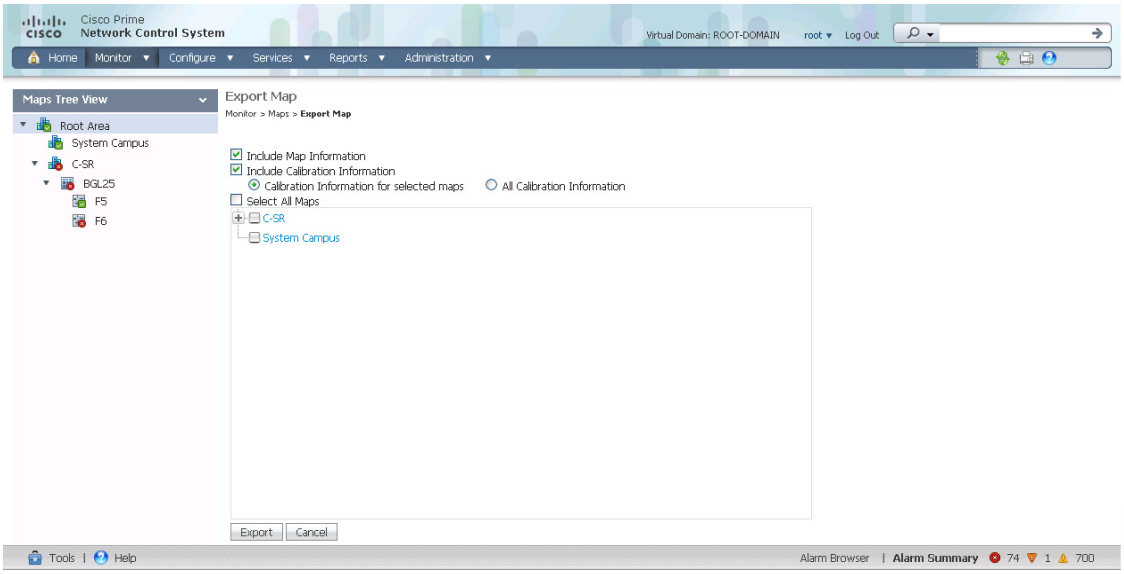
The Export Map feature allows you to export map or calibration information to XML. The exported XML is in an encrypted format and is readable. XML and images are bundled, tarred, and zipped into a file for a successful import into another NCS.

To export a map, follow these steps:

Step 1 Choose **Monitor > Site Maps** page.

Step 2 From the Select a command drop-down list, choose **Export Maps**. The Export Map page appears. (see Figure 6-9).

Figure 6-9 Export Map



Step 3 Select the maps that you want to export.

Step 4 Click **Export** to export the selected map data.

Importing a Map

The Import Map feature allows you to import map information from external sources such as XML, WLSE, and CSV. During import, the XML might be encrypted (if exported from the NCS) or unencrypted.

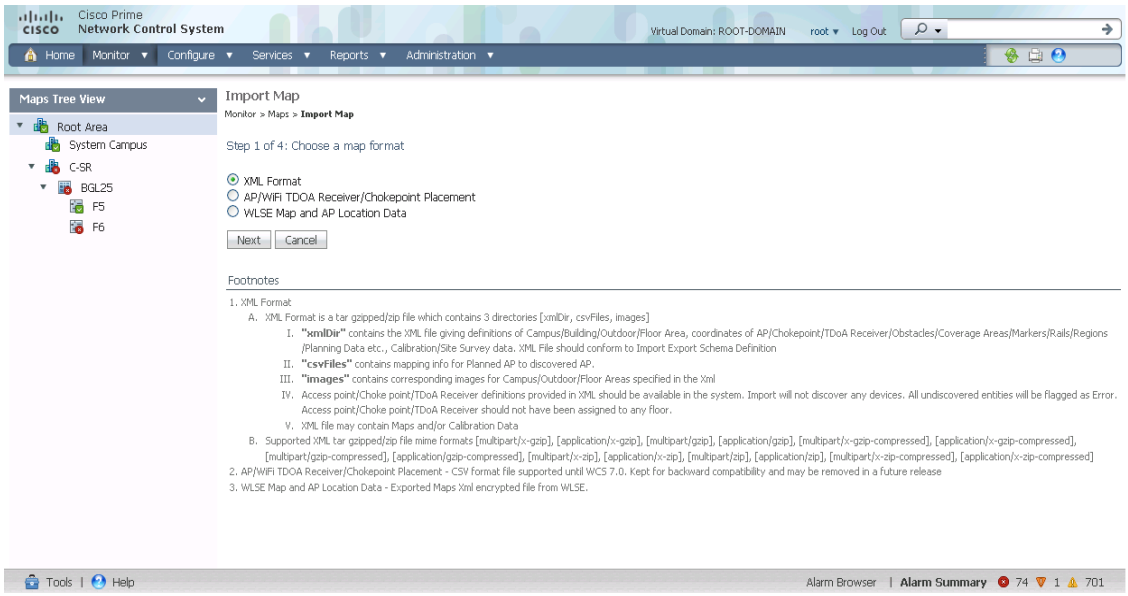
To import a map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **Import Maps**. The Import Map page appears.

Note It is important that APs are first added to the NCS Server prior to importing maps, because APs in the maps are also included during the export process. APs that have not been added to the NCS server but are present in exported floor maps result in an error being displayed during importing these maps into the NCS. If APs are unassociated or unreachable, it results in the same error and you must manually add these APs to your maps after the importing process.

Figure 6-10 Import Map



Step 3 Choose the map format.

Step 4 Select one of the following formats:

- XML
- AP/WiFi TDOA Receiver/Chokepoint Placement
- WLSE Map and AP Location Data

Note The XML format option is available only to the root user.

Note The Aeroscout engine fails to start MSE if the NCS map names have special characters such as '&'.

Step 5 Click **Next**.

Step 6 Click **Browse** to select the file that you want to import.

Step 7 Click **Import** to import the selected data.

Editing Map Properties

To edit your map properties, follow these steps:

Note Users with Map read-write permissions can only edit the map properties.

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **Properties**.

Step 3 Click **Go**.

Step 4 Edit the information in Table 6-1.

Table 6-1 Map Properties Fields

Field or Control	Description
Unit of Dimension	Set dimension measurement in feet or meters for all NCS maps.
Wall Usage Calibration	Choose to use or not use walls, or set to automatic.
Refresh Map From Network	Enable refresh of map data for the NCS to update maps by polling the Cisco WLAN Solution each time a Cisco WLAN Solution operator requests a map update. Select the **Disable** check box to disable map updates for the NCS from its stored database. **Note** Updates to the database might not be frequent enough to keep the map data current.
Advanced Debug Mode	This option must be enabled on both the location appliance and the NCS to allow use of the location accuracy testpoint feature.
Use Dynamic Heatmaps	This option must be enabled to allow use of dynamic heatmaps. By default, it is enabled.
Minimum Number of APs for Dynamic Heatmaps	Dynamic heatmap of an AP is calculated only if it receives the RSSI strengths from a number of neighboring APs, which should be greater than or equal to this parameter value. The minimum and default is 4 and the maximum number of APs is 10.
Recomputation Frequency (Hours)	Configure the time when you want the data to be polled and refreshed when you are not actively using the maps. You can always refresh the data and get the latest heatmaps when you are actively using the maps. The default is 6 hours. The minimum is 1 hour and the maximum is 24 hours. We recommend a minimum number of APs as 4 and 6 hours as recomputation frequency for maximum performance.

Filtering Maps

In the Monitor > Site Maps page, the list of maps can be filtered based on type and status. To filter your map list, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Choose the map type from the Type drop-down list. Map types include **All**, **Campus**, **Building**, **Outdoor Area**, and **Floor Area**.

Step 3 To further sort the map list by status, choose the status type from the Status drop-down list. Status types include **All**, **Critical**, **Major**, and **Minor**.

Note Status indicates the most serious level of alarm on an access point located on this map or one of its children.

Step 4 When the filtering criteria is selected, click **Go**. The list displays maps which fit the filtering criteria.

Configuring Buildings

You can add buildings to the NCS database regardless of whether you have added campus maps to the database. This section describes how to add a building to a campus map or a standalone building (one that is not part of a campus) to the NCS database.

This section contains the following topics:

Adding a Building to a Campus Map

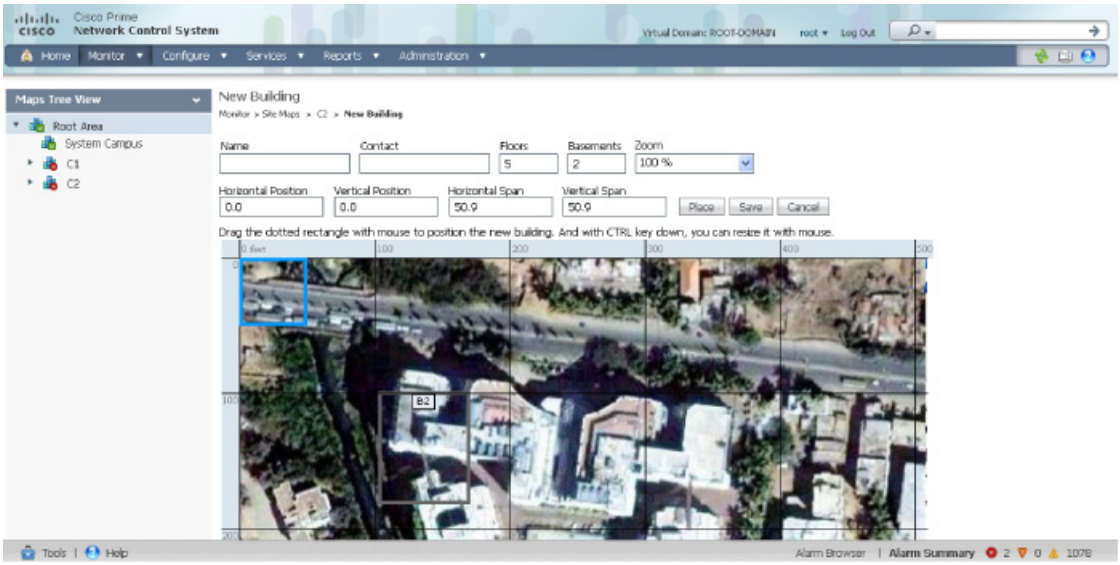
To add a building to a campus map in the NCS database, follow these steps:

Step 1 Choose **Monitor > Site Maps** to display the Maps page.

Step 2 Click the desired campus. The Site Maps > Campus Name page appears.

Step 3 From the Select a command drop-down list, choose **New Building**, and click **Go** (see Figure 6-11).

Figure 6-11 New Building



Step 4 In the Campus Name > New Building page, follow these steps to create a virtual building in which to organize related floor plan maps:

a. Enter the building name.

b. Enter the building contact name.

c. Enter the number of floors and basements.

d. Enter the horizontal position (distance from the corner of the building rectangle to the left edge of the campus map) and the vertical position (distance from the corner of the building rectangle to the top edge of the campus map) in feet.

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps**, and choose **Properties** from the Select a command drop-down list.

e. Enter an approximate building horizontal span and vertical span (width and depth on the map) in feet.

Note The horizontal and vertical span should be larger than or the same size as any floors that you might add later.

Tip You can also use **Ctrl-click** to resize the bounding area in the upper-left corner of the campus map. As you change the size of the bounding area, the Horizontal Span and Vertical Span parameters of the building change to match your actions.

f. Click **Place** to put the building on the campus map. The NCS creates a building rectangle scaled to the size of the campus map.

g. Click the building rectangle and drag it to the desired position on the campus map.

Note After adding a new building, you can move it from one campus to another without having to recreate it.

h. Click **Save** to save this building and its campus location to the database. The NCS saves the building name in the building rectangle on the campus map.

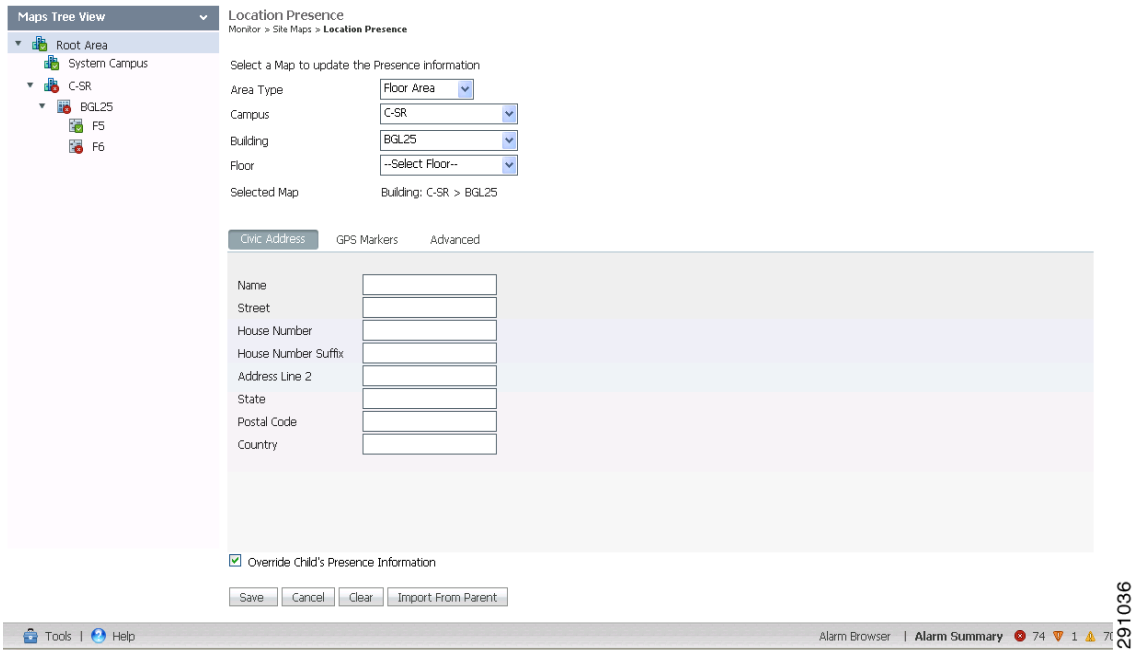
Note A hyperlink associated with the building takes you to the corresponding Map page.

Step 5 (Optional) To assign location presence information for the new outdoor area, do the following:

a. Choose **Edit Location Presence Info** from the Select a command drop-down list. Click **Go**. The Location Presence page appears (see Figure 6-12).

Note By default, the Presence Info check box of the Override Child Element is selected. This option should remain selected if you want to propagate the campus location to all buildings and floors on that campus. When adding buildings to the campus map, you can import the campus location information. The campus address cannot be imported to a building if the check box is unselected. This option should be unselected if you want to assign building-specific addresses to buildings on its campus rather than one campus address to all.

Figure 6-12 Location Presence



b. Click the **Civic Address**, **GPS Markers**, or **Advanced** tab.

- Civic Address identifies the campus by name, street, house number, house number suffix, city (address line2), state, postal code, and country.
- GPS Markers identify the campus by longitude and latitude.

– Advanced identifies the campus with expanded civic information such as neighborhood, city division, country, and postal community name.

Note Each selected field is inclusive of all of those above it. For example, if you choose Advanced, it can also provide GPS and Civic location information upon client demand. The selected setting must match what is set on the location server level (Services > Mobility Services).

Note If a client requests location information such as GPS Markers for a campus, building, floor, or outdoor area that is not configured for that field, an error message is returned.

c. By default, the Override Child's Presence Information check box is selected. There is no need to alter this setting for standalone buildings.

Step 6 Click **Save**.

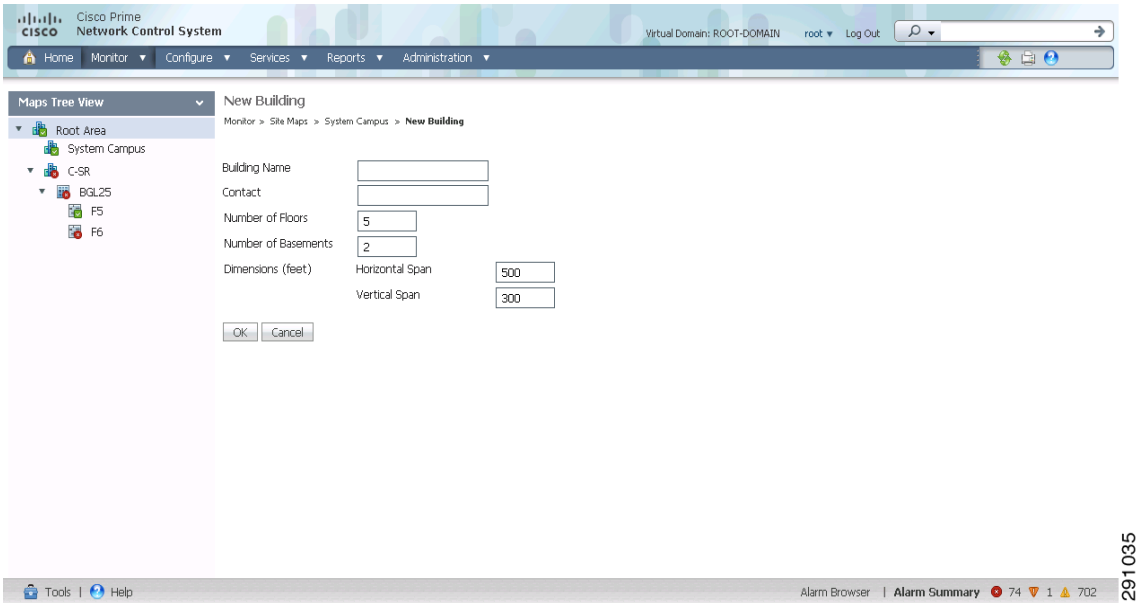
Adding a Standalone Building

To add a standalone building to the NCS database, follow these steps:

Step 1 Choose **Monitor > Site Maps** to display the Maps page.

Step 2 From the Select a command drop-down list, choose **New Building**, and click **Go** (see Figure 6-11).

Figure 6-13 New Standalone Building



Step 3 In the Maps > New Building page, follow these steps to create a virtual building in which to organize related floor plan maps:

a. Enter the building name.

b. Enter the building contact name.

Note After adding a new building, you can move it from one campus to another without having to recreate it.

c. Enter the number of floors and basements.

d. Enter an approximate building horizontal span and vertical span (width and depth on the map) in feet.

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps**, and choose **Properties** from the Select a command drop-down list.

Note The horizontal and vertical span should be larger than or the same size as any floors that you might add later.

e. Click **OK** to save this building to the database.

Step 4 (Optional) To assign location presence information for the new building, do the following:

a. Choose **Location Presence** from the Select a command drop-down list. Click **Go**. The Location Presence page appears (see Figure 6-12).

b. Click the **Civic**, **GPS Markers**, or **Advanced** tab.

- Civic Address identifies the campus by name, street, house number, house number suffix, city (address line2), state, postal code, and country.
- GPS Markers identify the campus by longitude and latitude.
- Advanced identifies the campus with expanded civic information such as neighborhood, city division, county, and postal community name.

Note Each selected field is inclusive of all of those above it. For example, if you select Advanced, it can also provide GPS and Civic location information upon client demand. The selected setting must match what is set on the location server level (Services > Mobility Services).

Note If a client requests location information such as GPS Markers for a campus, building, floor, or outdoor area that is not configured for that field, an error message is returned.

c. By default, the Presence Info check box of the Override Child Element is selected. This option should remain selected if you want to propagate the campus location to all buildings and floors on that campus. When adding buildings to the campus map, you can import the location information. The campus address cannot be imported to a building if the check box is unselected. This option should be deselected if you want to assign building-specific addresses to buildings on its campus rather than one campus address to all.

Step 5 Click **Save**.

Note The standalone buildings are automatically placed in System Campus.

Viewing a Building

To view a current building map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the building map to open its details page. The Building View page provides a list of floor maps and map details for each floor.

Note From the Building View page, you can click the Floor column heading to sort the list ascending or descending by floor.

The map details include the following:

- Floor area
- Floor index—Indicates the floor level. A negative number indicates a basement floor level.
- Contact
- Status—Indicates the most serious level of alarm on an access point located on this map or one of its children.
- Number of total access points located on the map.
- Number of 802.11a/n and 802.11b/g/n radios located on the map.
- Number of out of service (OOS) radios.
- Number of clients—Click the number link to view the Monitor > Clients page. See the "Monitoring Clients and Users" section on page 10-10 for more information.

Step 3 The Select a command drop-down list provides the following options:

- New Floor Area—See the "Adding Floor Areas to a Campus Building" section on page 6-28 or the "Adding Floor Plans to a Standalone Building" section on page 6-32 for more information.
- Edit Building—See the "Editing a Building" section on page 6-21 for more information.
- Delete Building—See the "Deleting a Building" section on page 6-22 for more information.
- Copy Building—See the "Copying a Map" section on page 6-11 for more information.
- Edit Location Presence Info—See the "Managing Location Presence Information" section on page 6-70 for more information.

Editing a Building

To edit a current building map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the building map to open its details page.

Step 3 From the Select a command drop-down list, choose **Edit Building**.

Step 4 Make any necessary changes to Building Name, Contact, Number of Floors, Number of Basements, and Dimensions (feet).

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps**, and choose **Properties** from the Select a command drop-down list.

Step 5 Click **OK**.

Deleting a Building

To delete a current building map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the check box for the building that you want to delete.

Step 3 Click **Delete** at the bottom of the map list (or choose **Delete Maps** from the Select a command drop-down list, and click **Go**).

Step 4 Click **OK** to confirm the deletion.

Note Deleting a building also deletes all of its container maps. The access points from all deleted maps are moved to an Unassigned state.

Moving a Building

To move a building to a different campus, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the check box of the applicable building.

Step 3 From the Select a command drop-down list, choose **Move Buildings**.

Step 4 Click **Go**.

Step 5 Choose the Target Campus from the drop-down list.

Step 6 Select the buildings that you want to move. Unselect any buildings that remain in their current location.

Step 7 Click **OK**.

Configuring Campus

This section contains the following topics:

Adding a Campus Map

To add a single campus map to the NCS database, follow these steps:

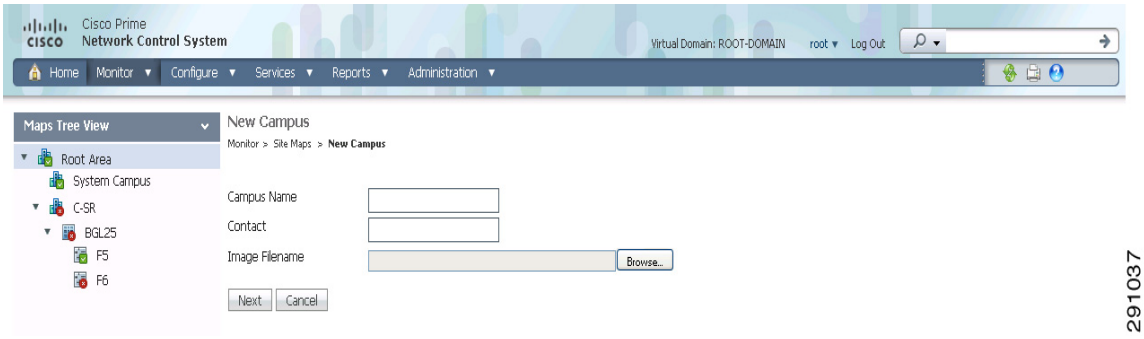
Step 1 Save the map in .PNG, .JPG, .JPEG, or .GIF format.

Note The map can be of any size because the NCS automatically resizes the map to fit its working areas.

Step 2 Browse to and import the map from anywhere in your file system.

Step 3 Choose **Monitor > Site Maps** to display the Maps page (see Figure 6-14).

Figure 6-14 New Campus



Step 4 From the Select a command drop-down list, choose **New Campus**, and click **Go**.

Step 5 In the Maps > New Campus page, enter the campus name and campus contact name.

Step 6 Browse to and choose the image filename containing the map of the campus, and click **Open**.

Step 7 Select the **Maintain Aspect Ratio** check box to prevent length and width distortion when the NCS resizes the map.

Step 8 Enter the horizontal and vertical span of the map in feet.

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps** and choose **Properties** from the Select a command drop-down list. The horizontal and vertical span should be larger than any building or floor plan to be added to the campus.

Step 9 Click **OK** to add this campus map to the NCS database. The NCS displays the Maps page, which lists maps in the database, map types, and campus status.

Step 10 (Optional) To assign location presence information, click the newly created campus link in the Monitor > Site Maps page. See the "Managing Location Presence Information" section on page 6-70 for more information.

Viewing a Campus Map

To view a current campus map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the campus map to open its details page.

Step 3 The Select a command drop-down list provides the following options:

- New Building—See the "Adding a Building to a Campus Map" section on page 6-16 for more information.
- New Outdoor Area—See the "Adding an Outdoor Area" section on page 6-25 for more information.
- Edit Campus—See the "Editing a Campus Map" section on page 6-24 for more information.
- Delete Campus—See the "Deleting a Campus Map" section on page 6-25 for more information.
- Copy Campus—See the "Copying a Map" section on page 6-11 for more information.
- Edit Location Presence Information—See the "Managing Location Presence Information" section on page 6-70 for more information.

Note Use the Monitor > Site Maps > Campus View main navigation bar at the top of the campus image to enlarge or decrease the size of the map view and to hide or show the map grid (which displays the map size in feet or meters).

Editing a Campus Map

The edit feature allows you to make changes to a current campus map. You can change the campus name, contact person, image, and map dimensions.

To edit a current campus map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the campus map to open its details page.

Step 3 From the Select a command drop-down list, choose **Edit Campus**.

Step 4 Make any necessary changes to Campus Name, Contact, or Image File.

Step 5 Click **Next**.

Step 6 Make any additional changes to Maintain Aspect Ratio or Dimensions (feet).

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps**, and choose **Properties** from the Select a command drop-down list.

Step 7 Click **OK**.

Deleting a Campus Map

To delete a current campus map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the check box for the campus that you want to delete.

Step 3 Click **Delete** at the bottom of the map list or choose **Delete Maps** from the Select a command drop-down list, and click **Go**.

Step 4 Click **OK** to confirm the deletion.

Note Deleting a campus also deletes all of its container maps. The access points from all deleted maps are moved to an Unassigned state.

Configuring Outdoor Areas

This section contains the following topics:

Adding an Outdoor Area

Note You can add an outdoor area to a campus map in the NCS database regardless of whether you have added outdoor area maps to the database.

To add an outdoor area to a campus map, follow these steps:

Step 1 If you want to add a map of the outdoor area to the database, save the map in .PNG, .JPG, .JPEG, or .GIF format. Then browse to and import the map from anywhere in your file system.

Note You do not need a map to add an outdoor area. You can simply define the dimensions of the area to add it to the database. The map can be any size because the NCS automatically resizes the map to fit the workspace.

Step 2 Choose **Monitor > Site Maps**.

Step 3 Click the desired campus to display the Monitor > Site Maps > Campus View page.

Step 4 From the Select a command drop-down list, choose **New Outdoor Area.**

Step 5 Click **Go**. The Create New Area page appears.

Step 6 In the New Outdoor Area page, enter the following information:

- Name—The user-defined name of the new outdoor area.
- Contact—The user-defined contact name.
- Area Type (RF Model)—Cubes And Walled Offices, Drywall Office Only, Outdoor Open Space (default).
- AP Height (feet)—Enter the height of the access point.
- Image File—Name of the file containing the outdoor area map. Click **Browse** to find the file.

Step 7 Click **Next**.

Step 8 Enter the following information:

- Zoom—Use to zoom in or zoom out on the map that you are currently viewing.
- Maintain Image Aspect Ratio—Select this check box to maintain the aspect ratio (ratio of horizontal and vertical pixels) of the map image. Maintaining the aspect ratio prevents visual distortion of the map.
- Horizontal Position—Distance from the corner of the outdoor area rectangle to the left edge of the campus map, in feet or meters.
- Vertical Position—Distance from the corner of the outdoor area rectangle to the top edge of the campus map, in feet or meters.
- Horizontal Span—Horizontal measurement (left to right) of the outdoor area rectangle, in feet or meters.
- Vertical Span—Vertical measurement (up and down) of the outdoor area rectangle, in feet or meters.

Tip The horizontal and vertical spans should be larger than or the same size. Use **Ctrl-click** to resize the bounding area in the upper-left corner of the campus map. The horizontal and vertical span parameters change to match.

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps**, and choose **Properties** from the Select a command drop-down list.

Step 9 Click **Place** to put the outdoor area on the campus map. The NCS creates an outdoor area rectangle scaled to the size of the campus map.

Step 10 Click and drag the outdoor area rectangle to the desired position on the campus map.

Step 11 Click **Save** to save this outdoor area and its campus location to the database.

Note A hyperlink associated with the outdoor area takes you to the corresponding Maps page.

Step 12 (Optional) To assign location presence information for the new outdoor area, choose **Edit Location Presence Info**, and click **Go**. See the "Managing Location Presence Information" section on page 6-70 for more information.

Note By default, the Override Child Element Presence Info check box is selected. There is no need to alter this setting for outdoor areas.

Editing Outdoor Areas

To edit a current outdoor area, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the desired outdoor area map from the Name column.

Step 3 From the Select a command drop-down list, choose **Edit Outdoor Area**.

Step 4 Click **Go**.

Step 5 In the Campus Name > Outdoor Area page, edit the following information:

- Name—The user-defined name of the new outdoor area.
- Contact—The user-defined contact name.
- New Image File—Click **Browse** to import a new image file, if necessary.
- Maintain Image Aspect Ratio—Select this check box to maintain the aspect ratio (ratio of horizontal and vertical pixels) of the map image. Maintaining the aspect ratio prevents visual distortion of the map.
- Horizontal Position—Distance from the corner of the outdoor area rectangle to the left edge of the campus map, in ft. or meters.
- Vertical Position—Distance from the corner of the outdoor area rectangle to the top edge of the campus map, in ft. or meters.
- Horizontal Span—Horizontal measurement (left to right) of the outdoor area rectangle, in ft. or meters.
- Vertical Span—Vertical measurement (up and down) of the outdoor area rectangle, in ft. or meters.

Step 6 Click **Place** to put the outdoor area on the campus map. The NCS creates an outdoor area rectangle scaled to the size of the campus map.

Step 7 Click and drag the outdoor area rectangle to the desired position on the campus map.

Step 8 Click **Save** to save this outdoor area and its campus location to the database.

Note A hyperlink associated with the outdoor area takes you to the corresponding Maps page.

Deleting Outdoor Areas

To delete a current outdoor area, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the check box for the outdoor area that you want to delete.

Step 3 Click **Delete** at the bottom of the map list (or choose **Delete Maps** from the Select a command drop-down list, and click **Go**).

Step 4 Click **OK** to confirm the deletion.

Configuring Floor Areas

This section describes how to add floor plans to either a campus building or a standalone building in the NCS database and contains the following topics:

Adding Floor Areas to a Campus Building

After you add a building to a campus map, you can add individual floor plan and basement maps to the building.

To add a floor area to a campus building, follow these steps:

Step 1 Save your floor plan maps in .PNG, .JPG, or .GIF format.

Note The maps can be any size because the NCS automatically resizes the maps to fit the workspace.

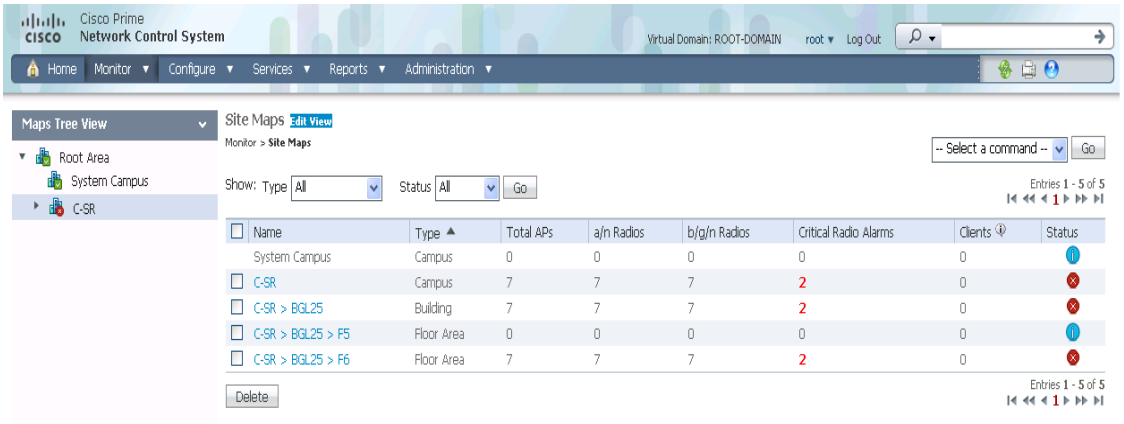
Step 2 Browse to and import the floor plan maps from anywhere in your file system. You can also import CAD image files DXF, and DWG.

Note If there are problems converting the auto-cad file, an error message is displayed. The NCS uses a native image conversion library to convert auto-cad files into raster formats like .PNG. If the native library cannot be loaded, the NCS displays an "unable to convert the auto-cad file" message. If you receive this error, make sure all the required dependencies are met for the native library. To find any dependency problems, use ldd on Linux platforms. The following DLLs must be present under the /webnms/rfdlls NCS installation directory: LIBGFL254.DLL, MFC71.DLL, MSVCR71.DLL, and MSVCP71.DLL. If dependency problems occur, you might need to install the required libraries and restart the NCS.

Note An imported auto-cad file can become blurred when you zoom. Without the zoom, the clarity is about the same as the original auto-cad file. Make sure all relevant sections are clearly visible in the original auto-cad file (DWG/DXF) and then import the auto-cad file into .PNG/.GIF format rather than .JPEG or .JPG.

Step 3 Choose **Monitor > Site Maps**. The Maps page appears (See Figure 6-15).

Figure 6-15 Monitor > Site Maps



Step 4 From the Maps Tree View or the Monitor > Site Maps list, choose the applicable campus building to open the Building View page.

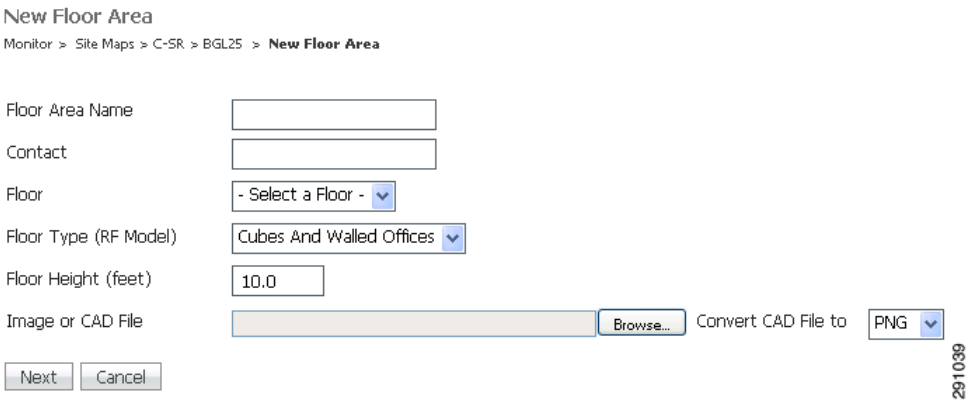
Step 5 Hover your mouse cursor over the name within an existing building rectangle to highlight it.

Note You can also access the building from the Campus View page. In the Campus View page, click the building name to open the Building View page.

Step 6 From the Select a command drop-down list, choose **New Floor Area**.

Step 7 Click **Go**. The New Floor Area page appears. (See Figure 6-16).

Figure 6-16 New Floor Area



Step 8 In the New Floor Area page, follow these steps to add floors to a building in which to organize related floor plan maps:

a. Enter the floor area and contact names.

b. Choose the floor or basement number from the Floor drop-down list.

c. Choose the floor or basement type (RF Model).

d. Enter the floor-to-floor height in feet.

Note To change the unit of measurement (feet or meters), choose **Monitor > Site Maps**, and choose **Properties** from the Select a command drop-down list.

e. Select the **Image or CAD File** check box.

f. Browse to and choose the desired floor or basement image or CAD filename, and click **Open**.

Note If you are importing a CAD file, use the Convert CAD File drop-down list to determine the image file for conversion.

Tip We do not recommend a .JPEG (.JPG) format for an auto-cad conversion. Unless a JPEG is specifically required, use .PNG or .GIF format for higher quality images.

g. Click **Next**. At this point, if a CAD file was specified, a default image preview is generated and loaded.

Note The NCS uses a native image conversion library to convert auto-cad files into raster formats like .PNG. When there are issues loading the native library, the NCS displays the following error: "Unable to convert the auto-cad file. Reason: Error while loading the auto-cad image conversion library." For more information see the NCS online help or NCS documentation.

The names of the CAD file layers are listed with check boxes to the right side of the image indicating which are enabled.

Note When you choose the floor or basement image filename, the NCS displays the image in the building-sized grid.

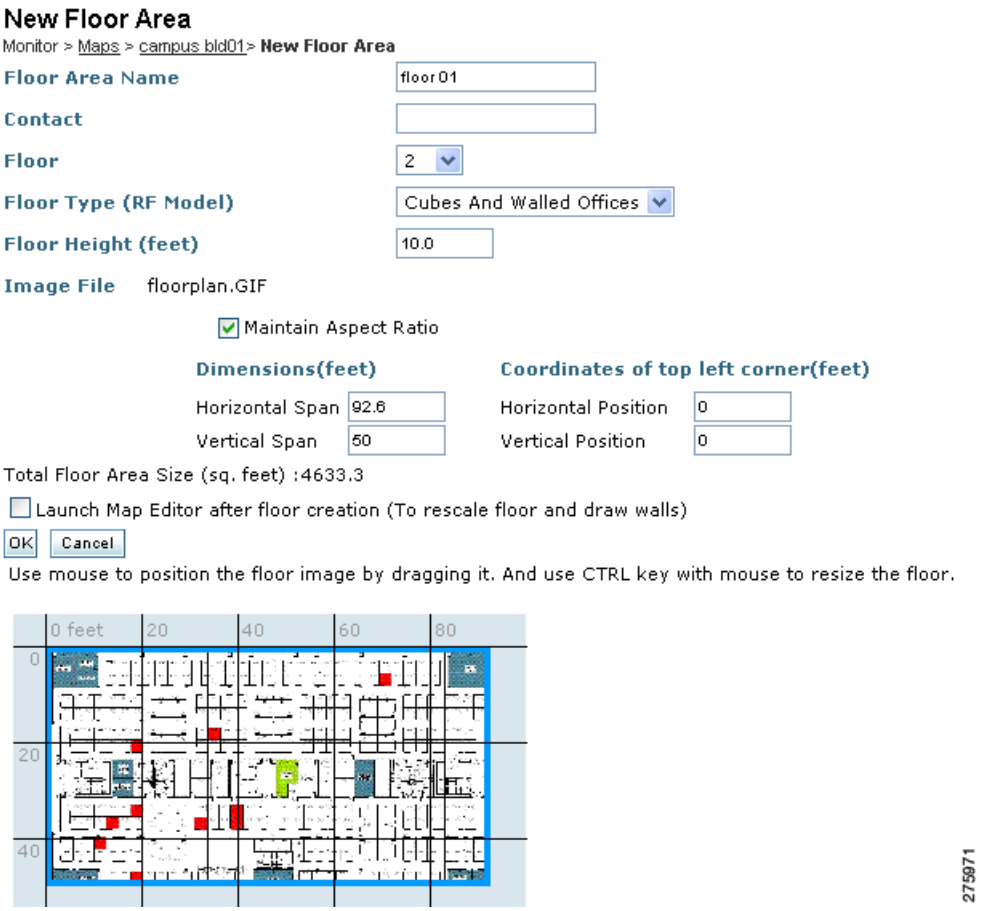
Note The maps can be any size because the NCS automatically resizes the maps to fit the workspace.

Note The map must be saved in .PNG, .JPG, .JPEG, or .GIF format.

h. If you have CAD file layers, you can select or deselect as many as you want and click **Preview** to view an updated image. Click **Next** when you are ready to proceed with the selected layers.

Enter the remaining parameters for the floor area (See Figure 6-17).

Figure 6-17 New Floor Area Fields



i. Either leave the **Maintain Aspect Ratio** check box selected to preserve the original image aspect ratio or unselect the check box to change the image aspect ratio.

j. Enter an approximate floor or basement horizontal and vertical span (width and depth on the map) in feet.

Note The horizontal and vertical spans should be smaller than or the same size as the building horizontal and vertical spans in the NCS database.

k. If applicable, enter the horizontal position (distance from the corner of the outdoor area rectangle to the left edge of the campus map) and vertical position (distance from the corner of the outdoor area rectangle to the top edge of the campus map) in feet or meters.

Tip Use **Ctrl-click** to resize the image within the building-sized grid.

l. If desired, select the **Launch Map Editor after floor creation** check box to rescale the floor and draw walls.

m. Click **OK** to save this floor plan to the database. The floor is added to the Maps Tree View and the Monitor > Site Maps list.

Note Use different floor names in each building. If you are adding more than one building to the campus map, do not use a floor name that exists in another building. This overlap causes incorrect mapping information between a floor and a building.

Step 9 Click any of the floor or basement images to view the floor plan or basement map.

Note You can zoom in or out to view the map at different sizes and you can add access points. See the "Adding Access Points to a Floor Area" section on page 6-34 for more information.

Adding Floor Plans to a Standalone Building

After you have added a standalone building to the NCS database, you can add individual floor plan maps to the building.

To add floor plans to a standalone building, follow these steps:

Step 1 Save your floor plan maps in .PNG, .JPG, or .GIF format.

Note The maps can be any size because the NCS automatically resizes the maps to fit the workspace.

Step 2 Browse to and import the floor plan maps from anywhere in your file system. You can import CAD files in DXF or DWG formats or any of the formats you created in Step 1.

Note If there are problems converting the auto-cad file, an error message is displayed. The NCS uses a native image conversion library to convert auto-cad files into raster formats like .PNG. If the native library cannot be loaded, the NCS displays an "unable to convert the auto-cad file" message. If you receive this error, make sure all the required dependencies are met for the native library. To find any dependency problems, use ldd on Linux platforms. The following DLLs must be present under the /webnms/rfdlls NCS installation directory: LIBGFL254.DLL, MFC71.DLL, MSVCR71.DLL, and MSVCP71.DLL. If dependency problems occur, you might need to install the required libraries and restart the NCS.

Note An imported auto-cad file can become blurred when you zoom. Without the zoom, the clarity is about the same as the original auto-cad file. Make sure all relevant sections are clearly visible in the original auto-cad file (DWG/DXF) and then import the auto-cad file into .PNG/.GIF format rather than .JPEG or .JPG.

Step 3 Choose **Monitor > Site Maps**.

Step 4 From the Maps Tree View or the Monitor > Site Maps left sidebar menu, choose the desired building to display the Building View page.

Step 5 From the Select a command drop-down list, choose **New Floor Area**.

Step 6 Click **Go**.

Step 7 In the New Floor Area page, add the following information:

- Enter the floor area and contact names.
- Choose the floor or basement number from the Floor drop-down list.
- Choose the floor or basement type (RF Model).
- Enter the floor-to-floor height in feet.
- Select the **Image or CAD File** check box.
- Browse to and choose the desired floor or basement Image or CAD file, and click **Open**.

Note If you are importing a CAD file, use the Convert CAD File drop-down list to determine the image file for conversion.

Tip A .JPEG (.JPG) format is not recommended for an auto-cad conversion. Unless a .JPEG is specifically required, use a .PNG or .GIF format for higher quality images.

Step 8 Click **Next**. At this point, if a CAD file was specified, a default image preview is generated and loaded.

Note The NCS uses a native image conversion library to convert auto-cad files into raster formats like .PNG. When there are issues loading the native library, the NCS displays the following error: "Unable to convert the auto-cad file. Reason: Error while loading the auto-cad image conversion library. For more information, see the NCS online help or NCS documentation."

The names of the CAD file layers are listed with check boxes to the right side of the image indicating which are enabled.

Note When you choose the floor or basement image filename, the NCS displays the image in the building-sized grid.

Note The maps can be any size because the NCS automatically resizes the maps to fit the workspace.

Note The map must be saved in .PNG, .JPG, .JPEG, or .GIF format.

If you have CAD file layers, you can select or deselect as many as you want and click **Preview** to view an updated image. Click **Next** when you are ready to proceed with the selected layers.

Step 9 Enter the remaining parameters for the floor area.

- Either leave the **Maintain Aspect Ratio** check box selected to preserve the original image aspect ratio or unselect the check box to change the image aspect ratio.
- Enter an approximate floor or basement horizontal and vertical span (width and depth on the map) in feet.

Note The horizontal and vertical spans should be smaller than or the same size as the building horizontal and vertical spans in the NCS database.

- If applicable, enter the horizontal position (distance from the corner of the outdoor area rectangle to the left edge of the campus map) and vertical position (distance from the corner of the outdoor area rectangle to the top edge of the campus map) in feet or meters.

Tip Use **Ctrl-click** to resize the image within the building-sized grid.

- Adjust the floor characteristics with the NCS map editor by selecting the check box next to Launch Map Editor. See the "Map Editor" section on page 6-4 for more information regarding the map editor feature.

Step 10 Click **OK** to save this floor plan to the database. The floor is added to the Maps Tree View and the Monitor > Site Maps list.

Step 11 Click any of the floor or basement images to view the floor plan or basement map.

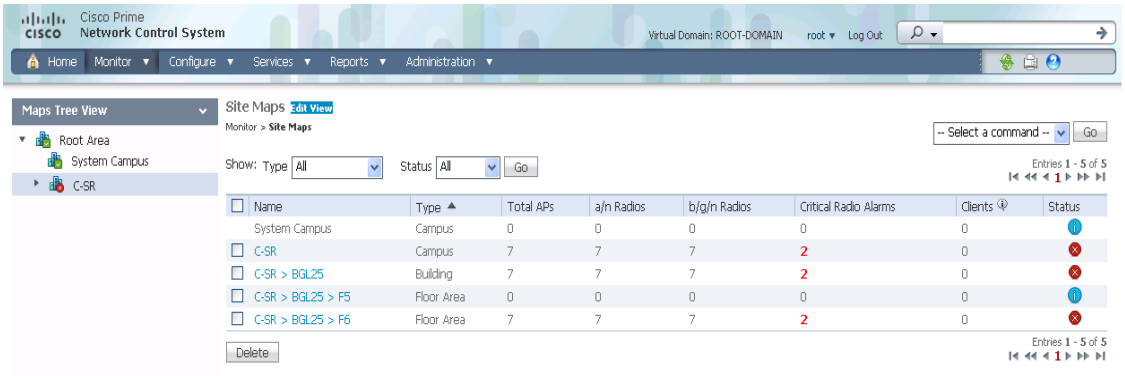
Note You can zoom in or out to view the map at different sizes and you can add access points. See the "Adding Access Points to a Floor Area" section on page 6-34 for more information.

Adding Access Points to a Floor Area

After you add the .PNG, .JPG, .JPEG, or .GIF format floor plan and outdoor area maps to the NCS database, you can position lightweight access point icons on the maps to show where they are installed in the buildings. To add access points to a floor area and outdoor area, follow these steps:

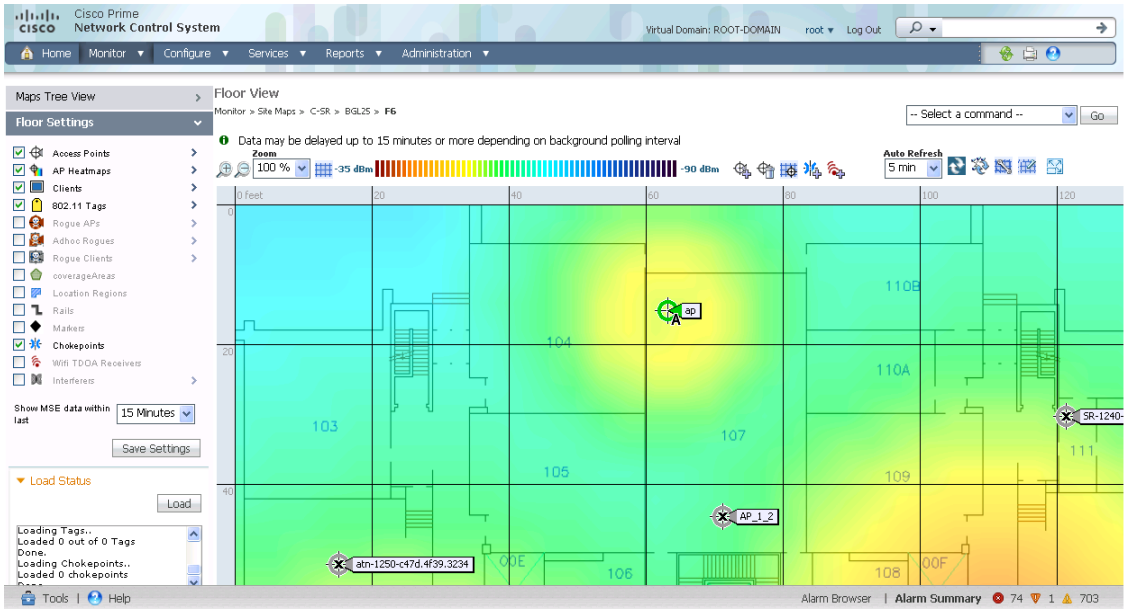
Step 1 Choose **Monitor > Site Maps**. The Maps page appears. (See Figure 6-18).

Figure 6-18 Monitor Site Maps



Step 2 From the Maps Tree View or the Monitor > Site Maps left sidebar menu, select the applicable floor to open the Floor View page. (See Figure 6-19).

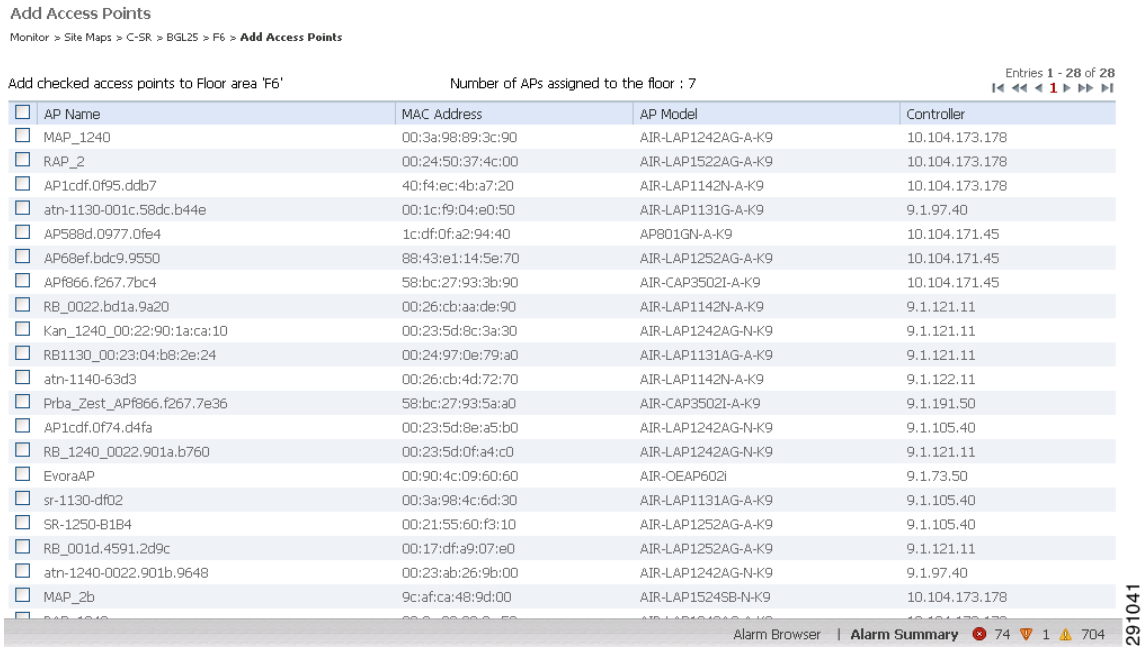
Figure 6-19 Floor View



Step 3 From the Select a command drop-down list, choose **Add Access Points,** and click **Go**.

Step 4 In the Add Access Points page, select the check boxes of the access points that you want to add to the floor area. (See Figure 6-20).

Figure 6-20 Add Access Point



Note Only access points that are not yet assigned to any floor or outdoor area appear in the list.

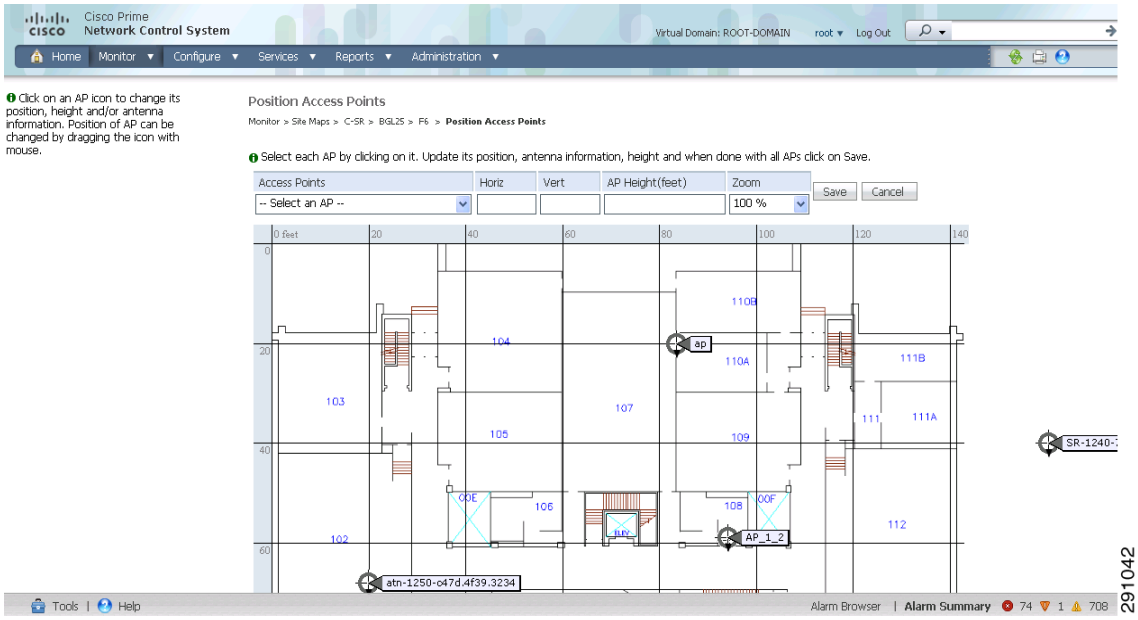
Note Select the check box at the top of the list to select all access points.

Note The NCS allows a maximum of 100 access points per floor map.

Step 5 When all of the applicable access points are selected, click **OK** located at the bottom of the access point list.

The Position Access Points page appears. (See Figure 6-21).

Figure 6-21 Position Access Points



Each access point you have chosen to add to the floor map is represented by a gray circle (differentiated by access point name or MAC address) and is lined up in the upper left part of the floor map.

Step 6 Click and drag each access point to the appropriate location. Access points turn blue when selected.

Note When you drag an access point on the map, its horizontal and vertical position appears in the Horiz and Vert text boxes.

Note The small black arrow at the side of each access point represents Side A of each access point, and each access point arrow must correspond with the direction in which the access points were installed. Side A is clearly noted on each 1000 series access point and has no relevance to the 802.11a/n radio. To adjust the directional arrow, choose the appropriate orientation from the Antenna Angle drop-down list.

When selected, the access point details are displayed on the left side of the page. Access point details include the following:

- AP Model—Indicates the model type of the selected access point.
- Protocol—Choose the protocol for this access point from the drop-down list.
- Antenna—Choose the appropriate antenna type for this access point from the drop-down list.
- Antenna/AP Image—The antenna image reflects the antenna selected from the Antenna drop-down list. Click the arrow at the top right of the antenna image to expand the image size.
- Antenna Orientation—Depending on the antenna type, enter the Azimuth and the Elevation orientations in degrees.

Note The Azimuth option does not appear for Omnidirectional antennas because their pattern is nondirectional in azimuth.

Note For internal antennas, the same elevation angle applies to both radios.

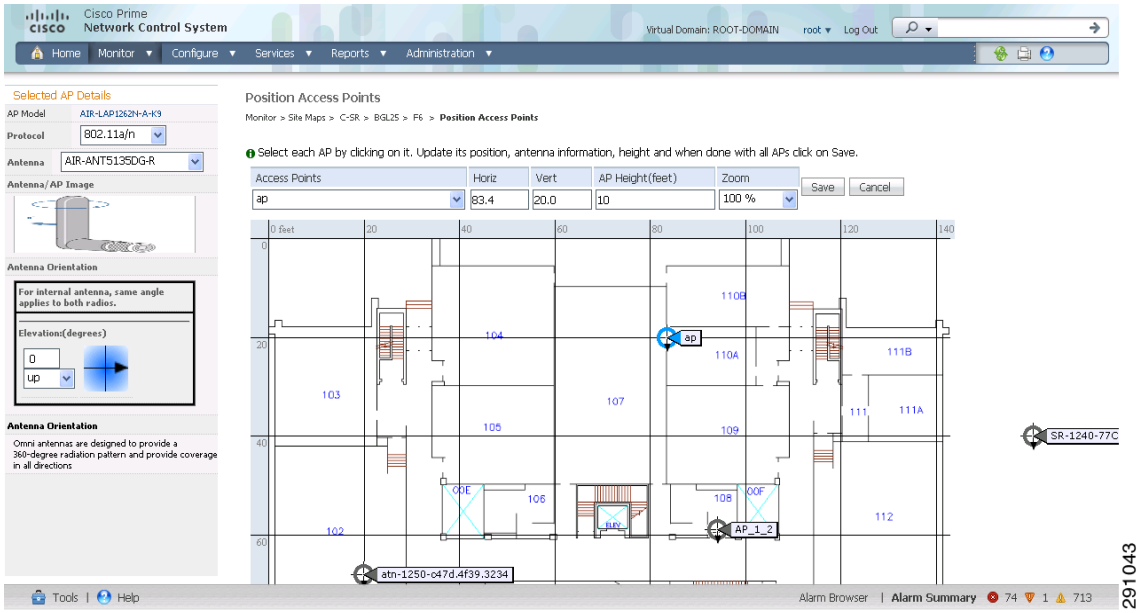
The antenna angle is relative to the map X axis. Because the origin of the X (horizontal) and Y (vertical) axes is in the upper left corner of the map, 0 degrees points side A of the access point to the right, 90 degrees points side A down, 180 degrees points side A to the left, and so on.

The antenna elevation is used to move the antenna vertically, up or down, to a maximum of 90 degrees.

Note Make sure each access point is in the correct location on the map and has the correct antenna orientation. Accurate access point positioning is critical when you use the maps to find coverage holes and rogue access points.

See the following URL for further information about the antenna elevation and azimuth patterns: http://www.cisco.com/en/US/products/hw/wireless/ps469/tsd_products_support_series_home.html

Figure 6-22 Selected Access Point Details



Step 7 When you are finished placing and adjusting each access point, click **Save**. (See Figure 6-22).

Note Clicking Save causes the antenna gain on the access point to correspond to the selected antenna. This might cause the radio to reset.

The NCS computes the RF prediction for the coverage area. These RF predictions are popularly known as *heat maps* because they show the relative intensity of the RF signals on the coverage area map.

Note This display is only an approximation of the actual RF signal intensity because it does not take into account the attenuation of various building materials, such as drywall or metal objects, nor does it display the effects of RF signals bouncing off obstructions.

Note Antenna gain settings have no effect on heatmaps and location calculations. Antenna gain is implicitly associated to the antenna name. Because of this, the following apply:
– If an antenna is used and marked as “Other” in the NCS, it is ignored for all heatmap and location calculations;
– If an antenna is used and marked as a Cisco antenna in the NCS, that antenna gain setting (internal value on the NCS) is used no matter what gain is set on the controller.

Figure 6-23 RF Prediction Heatmaps

Note See the “Placing Access Points” section on page 6-40 for more information on placing access points on a map.

Note You can change the position of access points by importing or exporting a file. See the “Positioning Access Points, Wi-Fi TDOA Receivers, and Chokepoints by Importing or Exporting a File” section on page 6-56 for more information.

Removing Access Points

To remove access points, follow these steps:

Step 1 Choose **NCS > Monitor > Site Maps > System Campus > *Building* > *Floor***

The Floor View page appears.

Step 2 From the drop-down list towards the right, choose **Remove Access Points**, and click **Go**.

The Remove Access Points page appears.

Step 3 Select the check box next to the access points, which you want to delete and click **OK** to delete the selected access points.

Editing Floor Areas

To edit a current floor area, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the floor area to open its details page.

Step 3 From the Select a command drop-down list, choose **Edit Floor Area**.

Step 4 Make any necessary changes to Floor Area Name, Contact, Floor, Floor Height (feet), Floor Type (RF Model), Existing Image File, or Import New Image File.

Step 5 Click **OK**.

Deleting Floor Areas

To delete a current floor area, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the check box for the applicable floor area.

Step 3 From the Select a command drop-down list, choose **Delete Maps**.

Step 4 Click **Go**.

Step 5 Click **OK** to confirm the deletion.

Placing Access Points

To determine the best location of all devices in the wireless LAN coverage areas, you need to consider the access point density and location.

Ensure that no fewer than 3 access points, and preferably 4 or 5, provide coverage to every area where device location is required. The more access points that detect a device, the better. This high level guideline translates into the following best practices, ordered by priority:

1. Most importantly, access points should surround the desired location.
2. One access point should be placed roughly every 50 to 70 linear feet (about 17 to 20 meters). This translates into one access point every 2,500 to 5000 square feet (about 230 to 450 square meters).

Note The access point must be mounted so that it is under 20 feet high. For best performance, a mounting at 10 feet would be ideal.

Following these guidelines makes it more likely that access points detect tracked devices. Rarely do two physical environments have the same RF characteristics. Users might need to adjust these parameters to their specific environment and requirements.

Note Devices must be detected at signals greater than –75 dBm for the controllers to forward information to the location appliance. No fewer than three access points should be able to detect any device at signals below –75 dBm.

Note If you have a ceiling-mounted AP with an integrated omni-directional antenna, the antenna orientation does not really need to be set in the NCS. However, if you mount that same AP on the wall, you must set the antenna orientation to 90 degrees.

Table 6-2 describes the orientation of the access points.

Table 6-2 Antenna Orientation of the Access Points

Access Point	Antenna Orientation
1140 mounted on the ceiling	The Cisco logo should be pointing to the floor. Elevation: 0 degrees.
1240 mounted on the ceiling	The antenna should be perpendicular to the access point. Elevation: 0 degrees.
1240 mounted on the wall	The antenna should be parallel to the access point. Elevation: 0 degrees. If the antenna is perpendicular to the AP then the angle is 90 degrees (up or down does not matter as the dipole is omni).

Configuring Floor Settings

You can modify the appearance of the floor map by selecting or unselecting various floor settings check boxes. The selected floor settings appears in the map image.

Note Depending on whether or not a mobility services engine is present in the NCS, some of the floor settings might not be displayed. Clients, 802.11 Tags, Rogue APs, Adhoc Rogues, Rouge Clients, and Interferers are visible only if an MSE is present in the NCS.

The Floor Settings options include the following:

- Access Points—See the "Filtering Access Point Floor Settings" section on page 6-48 for more information.
- AP Heatmaps—See the "Filtering Access Point Heatmap Floor Settings" section on page 6-50 for more information.

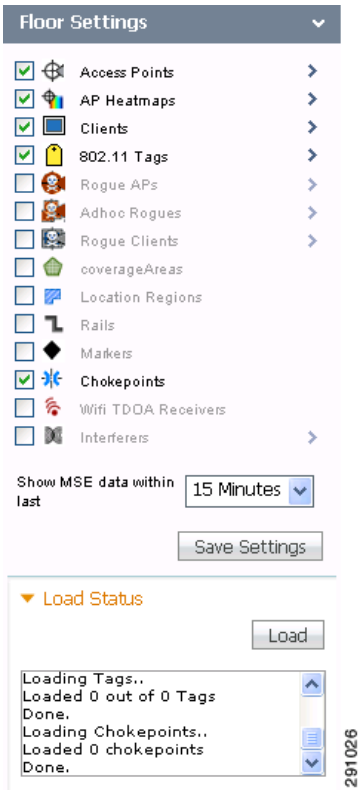
- AP Mesh Info—See the "Filtering AP Mesh Info Floor Settings" section on page 6-51 for more information.
- Clients—See the "Filtering Client Floor Settings" section on page 6-51 for more information.
- 802.11 Tags—See the "Filtering 802.11 Tag Floor Settings" section on page 6-53 for more information.
- Rogue APs—See the "Filtering Rogue AP Floor Settings" section on page 6-53 for more information.
- Rogue Adhocs—See the "Filtering Rogue Adhoc Floor Settings" section on page 6-54 for more information.
- Rogue Clients—See the "Filtering Rogue Client Floor Settings" section on page 6-54 for more information.
- Coverage Areas
- Location Regions
- Rails
- Markers
- Chokepoints
- Wi-Fi TDOA Receivers
- Interferers—See the "Filtering Interferer Settings" section on page 6-55 for more information.

Use the blue arrows to access floor setting filters for access points, access point heatmaps, clients, 802.11 tags, rogue access points, rogue adhocs, and rogue clients. When filtering options are selected, click **OK**.

Use the Show MSE data within last drop-down list to choose the timeframe for mobility services engine data. Choose to view mobility services engine data from a range including the past two minutes up to the past 24 hours. This option only appears if a mobility services engine is present on the NCS.

Click **Save Settings** to make the current view and filter settings your new default for all maps. (See Figure 6-24).

Figure 6-24 Floor Settings Fields



Defining Inclusion and Exclusion Regions on a Floor

To further refine location calculations on a floor, you can define the areas that are included (inclusion areas) in the calculations and those areas that are not included (exclusion areas).

For example, you might want to exclude areas such as an atrium or stairwell within a building but include a work area (such as cubicles, labs, or manufacturing floors).

Note If the MSE to which the floor is synchronized is running the Aeroscout tag engine, then inclusion and exclusion regions are not calculated for tags.

Viewing Floor Component Details

To view details regarding the components displayed on the Floor View, hover your mouse cursor over the applicable icon. A dialog box containing detailed information is displayed. Table 6-3 displays the floor map icons.

Table 6-3 Floor Map Icons

Icon	Description
	Access point icon. The color of the circle indicates the alarm status of the Cisco Radios. **Note** Each access point contains two Cisco Radios. When a single protocol is selected in the Access Point filter page, the entire icon represents this radio. If both protocols are selected, the top half of the icon represents the state of the 802.11a/n radio and the bottom half represents the state of the 802.11b/g/n radio. **Note** If a Cisco Radio is disabled, a small "x" appears in the middle of the icon. **Note** Monitor mode access points are shown with a gray label to distinguish these from other access points.
	AP heatmaps icon.
	Client icon. Hover your mouse cursor over the icon to view client details. See the "Client Details" section on page 6-106 for more information.
	Tag icon. Hover your mouse cursor over the icon to view tag details. See the "Tag Details" section on page 6-107 for more information.
	Rogue access point icon. The color of the icon indicates the type of rogue access point. For example, red indicates a malicious rogue access point and blue indicates an unknown type. Hover your mouse cursor over the icon to view rogue access point details. See the "Rogue Access Point Details" section on page 6-107 for more information.
	Rogue adhoc icon. Hover your mouse cursor over the icon to view rogue adhoc details. See the "Rogue Adhoc Details" section on page 6-108 for more information.
	Rogue client icon. Hover your mouse cursor over the icon to view rogue client details. See the "Rogue Client Details" section on page 6-108 for more information.
	Coverage icon.
	Location regions icon.
	Rails icon.

Table 6-3 Floor Map Icons (continued)

Icon	Description
	Marker icon.
	Chokepoint icon. See the "Chokepoints" section on page 6-4 for more information.
	Wi-Fi TDOA receiver icon. See the "Adding Wi-Fi TDOA Receivers to a Map" section on page 6-62 for more information.
	Interferer device icon. See the "Interferer Details" section on page 6-108 for more information.
	Indicates a guest client that is configured through web auth WLAN on WCS/NCS

Cisco 1000 Series Lightweight Access Point Icons

The icons indicate the present status of an access point. The circular part of the icon can be split in half horizontally. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.

Note When the icon is representing 802.11a/n and 802.11b/n, the top half displays the 802.11a/n status, and the bottom half displays the 802.11b/g/n status. When the icon is representing only 802.11b/g/n, the whole icon displays the 802.11b/g/n status. The triangle indicates the more severe color.

Table 6-4 shows the icons used in the NCS user interface Map displays.

Table 6-4 Access Points Icons Description

Icon	Description
	The green icon indicates an access point (AP) with no faults. The top half of the circle represents the optional 802.11a Cisco Radio. The bottom half of the circle represents the state of the 802.11b/g Cisco Radio.
	The yellow icon indicates an access point with a minor fault. The top half of the circle represents the optional 802.11a Cisco Radio. The bottom half of the circle represents the state of the 802.11b/g Cisco Radio. **Note** A flashing yellow icon indicates that there has been an 802.11a or 802.11b/g interference, noise, coverage, or load Profile Failure. A flashing yellow icon indicates that there have been 802.11a and 802.11b/g profile failures.
	The red icon indicates an access point (AP) with a major or critical fault. The top half of the circle represents the optional 802.11a Cisco Radio. The bottom half of the circle represents the state of the 802.11b/g Cisco Radio.

Table 6-4 Access Points Icons Description (continued)

Icon	Description
	The dimmed icon with a question mark in the middle represents an unreachable access point. It is gray because its status cannot be determined.
	The dimmed icon with no question mark in the middle represents an unassociated access point.
	The icon with a red “x” in the center of the circle represents an access point that has been administratively disabled.
	The icon with the top half green and the lower half yellow indicates that the optional 802.11a Cisco Radio (top) has no faults, and the 802.11b/g Cisco Radio (bottom) has a minor fault. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.
	The icon with the top half green and the lower half red indicates that the optional 802.11a Cisco Radio (top) is operational with no faults, and the 802.11b/g Cisco Radio (bottom) has a major or critical fault. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.
	The icon with the top half yellow and the lower half red indicates that the optional 802.11a Cisco Radio (top) has a minor fault, and the 802.11b/g Cisco Radio (bottom) has a major or critical fault. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.
	The icon with the top half yellow and the lower half green indicates that the optional 802.11a Cisco Radio (top) has a minor fault, and the 802.11b/g Cisco Radio (bottom) is operational with no faults. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.
	The icon with the top half red and the lower half green indicates that the optional 802.11a Cisco Radio (top) has a major or critical fault, and the 802.11b/g Cisco Radio (bottom) is operational with no faults. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.

Table 6-4 Access Points Icons Description (continued)

Icon	Description
	The icon with the top half red and the lower half yellow indicates that the optional 802.11a Cisco Radio (top) has major or critical faults, and the 802.11b/g Cisco Radio (bottom) has a minor fault. The more severe of the two Cisco Radio colors determines the color of the large triangular pointer.
     	The icon with a red “x” on the top half (optional 802.11a) shows that the indicated Cisco Radio has been administratively disabled. There are six color coding possibilities as shown.

Each of the access point icons includes a small black arrow that indicates the direction in which the internal Side A antenna points.

Table 6-5 shows some arrow examples used in the NCS user interface map displays.

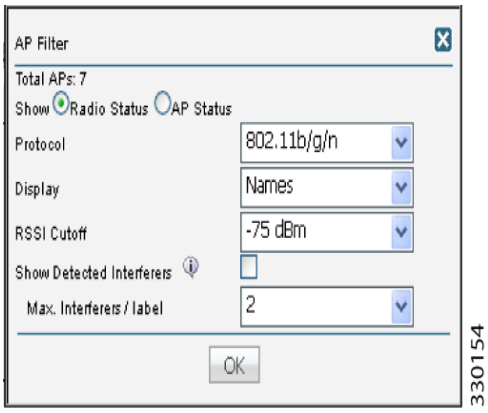
Table 6-5 Arrows

Arrow Examples	Direction
	Zero degrees, or to the right on the map.
	45 degrees, or to the lower right on the map.
	90 degrees, or down on the map.
These examples show the first three 45-degree increments allowed, with an additional five at 45-degree increments.	

Filtering Access Point Floor Settings

If you enable the access point floor setting and then click the blue arrow to the right of the floor settings, the Access Point Filter dialog box appears with filtering options. (See Figure 6-25).

Figure 6-25 Access Point Filter



Access point filtering options include the following:

- Show—Select this radio button to display the radio status or the access point status.

  Note Because the access point icon color is based on the access point status, the icon color might vary depending on the status selected. The default on floor maps is radio status.

- Protocol—From the drop-down list, choose which radio types to display (802.11a/n, 802.11b/g/n, or both).

  Note The displayed heatmaps correspond to the selected radio type(s).

- Display—From the drop-down list, choose what identifying information is displayed for the access points on the map image.
  - Channels—Displays the Cisco Radio channel number or Unavailable (if the access point is not connected).

    Note The available channels are defined by the country code setting and are regulated by country. See the following URL for more information: http://www.cisco.com/en/US/prod/collateral/wireless/ps5679/ps5861/product_data_sheet0900aecd80537b6a_ps430_Products_Data_Sheet.html

  - TX Power Level—Displays the current Cisco Radio transmit power level (with 1 being high) or Unavailable (if the access point is not connected).

    Note The power levels differ depending on the type of access point. The 1000 series access points accept a value between 1 and 5, the 1230 access points accept a value between 1 and 7, and the 1240 and 1100 series access points accept a value between 1 and 8.

Table 6-6 lists the transmit power level numbers and their corresponding power setting.

Table 6-6 Transmit Power Level Values

Transmit Power Level Number	Power Setting
1	Maximum power allowed per country code setting
2	50% power
3	25% power
4	12.5 to 6.25% power
5	6.25 to 0.195% power

Note The power levels are defined by the country code setting and are regulated by country. See the following URL for more information: http://www.cisco.com/en/US/prod/collateral/wireless/ps5679/ps5861/product_data_sheet0900aecd80537b6a_ps430_Products_Data_Sheet.html

- Channel and Tx Power—Displays both the channel and transmit power level (or Unavailable if the access point is not connected).
- Coverage Holes—Displays a percentage of clients whose signal has become weaker until the client lost its connection, Unavailable for unconnected access points, or MonitorOnly for access points in monitor-only mode.

Note Coverage holes are areas in which clients cannot receive a signal from the wireless network. When you deploy a wireless network, you must consider the cost of the initial network deployment and the percentage of coverage hole areas. A reasonable coverage hole criterion for launch is between 2 and 10 percent. This means that between two and ten test locations out of 100 random test locations might receive marginal service. After launch, Cisco Unified Wireless Network Solution Radio Resource Management (RRM) identifies these coverage hole areas and reports them to the IT manager, who can fill holes based on user demand.

- MAC Addresses—Displays the MAC address of the access point, whether or not the access point is associated to a controller.
- Names—Displays the access point name. This is the default value.
- Controller IP—Displays the IP address of the controller to which the access point is associated or Not Associated for disassociated access points.
- Utilization—Displays the percentage of bandwidth used by the associated client devices (including receiving, transmitting, and channel utilization). Displays Unavailable for disassociated access points and MonitorOnly for access points in monitor-only mode.
- Profiles—Displays the load, noise, interference, and coverage components of the corresponding operator-defined thresholds. Displays Okay for thresholds not exceeded, Issue for exceeded thresholds, or Unavailable for unconnected access points.

Note Use the Profile Type drop-down list to choose Load, Noise, Interference, or Coverage.

  - CleanAir Status—Displays the CleanAir status of the access point and whether or not CleanAir is enabled on the access point.
  - Average Air Quality—Displays the average air quality on this access point. The details include the band and the average air quality.
  - Minimum Air Quality—Displays the minimum air quality on this access point. The details include the band and the minimum air quality.
  - Average and Minimum Air Quality—Displays the average and minimum air quality on this access point. The details include the band, average air quality, and minimum air quality.
  - Associated Clients—Displays the number of associated clients, Unavailable for unconnected access points or MonitorOnly for access points in monitor-only mode.

    Note Click the client number to view client details. See "Monitoring Clients and Users" section on page 10-10 for more information.

  - Bridge Group Names

- RSSI Cutoff—From the drop-down list, choose the RSSI cutoff level. The RSSI cutoff ranges from -60 dBm to -90 dBm.
- Show Detected Interferers—Select the check box to display all interferers detected by the access point.
- Max. Interferers/label—Choose the maximum number of interferers to be displayed per label from the drop-down list.

Click **OK** when all applicable filtering criteria are selected.

Filtering Access Point Heatmap Floor Settings

An RF heatmap is a graphical representation of RF wireless data where the values taken by variables are represented in maps as colors. The current heatmap is computed based on the RSSI prediction model, Antenna Orientation, and AP transmit power.

If you enable the Access Point Heatmap floor setting and click the blue arrow to the right of the Floor Settings, the Contributing APs dialog appears with heatmap filtering options. See the "Understanding RF Heatmap Calculation" section on page 6-110 for more information.

The NCS introduces dynamic heatmaps. When dynamic heatmaps are enabled, the NCS recomputes the heatmaps to represent changed RSSI values. To configure the dynamic heatmaps, see the "Editing Map Properties" section on page 6-14 for more information.

Access point heatmap filtering options include the following:

- Heatmap Type—Select Coverage, or Air Quality. If you choose Air Quality, you can further filter the heat map type for access points with average air quality or minimum air quality. Select the appropriate radio button.

  Note If you have monitor mode access points on the floor plan, you have a choice between IDS or coverage heatmap types. A coverage heatmap excludes monitor mode access points.

  Note Only APs in Local, FlexConnect, or Bridge mode can contribute to the Coverage and Air Quality Heatmap.

- Total APs—Displays the number of access points positioned on the map.
- Select the access point check box(es) to determine which heatmaps are displayed on the image map.

Click **OK** when all applicable filtering criteria are selected.

Filtering AP Mesh Info Floor Settings

Note The AP Mesh Info check box only appears when bridging access points are added to the floor.

When this check box is selected, the NCS initiates a contact with the controllers and displays information about bridging access points. The following information is displayed:

- Link between the child and the parent access point.
- An arrow that indicates the direction from the child to parent access point.
- A color-coded link that indicates the signal-to-noise ratio (SNR). A green link represents a high SNR (above 25 dB), an amber link represents an acceptable SNR (20-25 dB), and a red link represents a very low SNR (below 20 dB).

If you enable the AP Mesh Info floor setting and click the blue arrow to the right of the floor settings, the Mesh Parent-Child Hierarchical View page appears with mesh filtering options.

You can update the map view by choosing the access points you want to see on the map. From the Quick Selections drop-down list, choose to select only root access point, various hops between the first and the fourth, or select all access points.

Note For a child access point to be visible, its parent must also be selected.

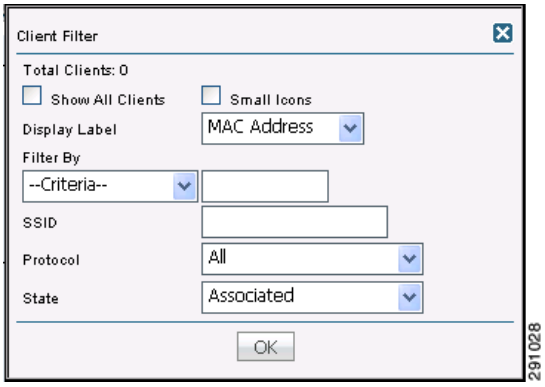
Click **OK** when all applicable filtering criteria are selected.

Filtering Client Floor Settings

Note The Clients option only appears if a mobility server is added in the NCS.

If you enable the Clients floor setting and click the blue arrow to the right, the Client Filter dialog box appears.

Figure 6-26 Client Filter



Client filtering options include the following:

- Show All Clients—Select the check box to display all clients on the map.
- Small Icons—Select the check box to display icons for each client on the map.

Note If you select the **Show All Clients** check box and **Small Icons** check box, all other drop-down list options are dimmed.

If you unselect the **Small Icons** check box, you can choose if you want the label to display the MAC address, IP address, username, asset name, asset group, or asset category.

If you unselect the **Show All Clients** check box, you can specify how you want the clients filtered and enter a particular SSID.

- Display—Choose the client identifier (IP address, username, MAC address, asset name, asset group, or asset category) to display on the map.
- Filter By—Choose the parameter by which you want to filter the clients (IP address, username, MAC address, asset name, asset group, asset category, or controller). Once selected, type the specific device in the text box.

Note Beginning with NCS Release 1.1 and later, you can not only filter IPv4 addresses but also IPv6 addresses as well. You can also specify partial IPv6 addresses as filter criteria.

Note If there are multiple IPv6 addresses for a client, then you can specify any one IP address to uniquely identify the client.

- SSID—Enter the client SSID in the available text box.
- Protocol—Choose All, 802.11a/n, or 802.11b/g/n from the drop-down list.
  - All—Displays all the access points in the area.
  - 802.11a/n—Displays a colored overlay depicting the coverage patterns for the clients with 802.11a/n radios. The colors show the received signal strength from red (–35 dBm) through dark blue (–85 dBm).

  - 802.11b/g/n—Displays a colored overlay depicting the coverage patterns for the clients with 802.11b/g/n radios. The colors show the received signal strength from red (–35 dBm) through dark blue (–85 dBm). This is the default value.
- State—Choose All, Idle, Authenticated, Probing, or Associated from the drop-down list.

Click **OK** when all applicable filtering criteria are selected.

Filtering 802.11 Tag Floor Settings

If you enable the 802.11 Tags floor setting and then click the blue arrow to the right, the Tag Filter dialog appears.

Tag filtering options include the following:

- Show All Tags—Select the check box to display all tags on the map.
- Small Icons—Select the check box to display icons for each tag on the map.

Note If you select the Show All Tags check box and Small Icons check box, all other drop-down list options are dimmed.

If you unselect the Small Icons check box, you can choose if you want the label to display MAC address, asset name, asset group, or asset category.

If you unselect the Show All Tags check box, you can specify how you want the tags filtered.

- Display—Choose the tag identifier (MAC address, asset name, asset group, or asset category) to display on the map.
- Filter By—Choose the parameter by which you want to filter the clients (MAC address, asset name, asset group, asset category, or controller). Once selected, type the specific device in the text box.

Click **OK** when all applicable filtering criteria are selected.

Filtering Rogue AP Floor Settings

If you enable the Rogue APs floor setting and then click the blue arrow to the right, the Rogue AP filter dialog box appears.

Rogue AP filtering options include the following:

- Show All Rogue APs—Select the check box to display all rogue access points on the map.
- Small Icons—Select the check box to display icons for each rogue access point on the map.

Note If you select the **Show All Rogue APs** check box and **Small Icons** check box, all other drop-down list options are dimmed.

If you unselect the **Show All Rogue APs** check box, you can specify how you want the rogue access points filtered.

- MAC Address—If you want to view a particular MAC address, enter it in the MAC Address text box.
- State—Use the drop-down list to choose from Alert, Known, Acknowledged, Contained, Threat, or Unknown contained states.

- On Network—Use the drop-down list to specify whether or not you want to display rogue access points on the network.

Click **OK** when all applicable filtering criteria are selected.

Filtering Rogue Adhoc Floor Settings

If you enable the Rogue Adhocs floor setting and then click the blue arrow to the right, the Rogue Adhoc filter dialog appears.

Rogue Adhoc filtering options include the following:

- Show All Rogue Adhocs—Select the check box to display all rogue adhoc on the map.
- Small Icons—Select the check box to display icons for each rogue adhoc on the map.

Note If you select the **Show All Rogue Adhocs** check box and **Small Icons** check box, all other drop-down list options are dimmed.

If you unselect the **Show All Rogue Adhocs** check box, you can specify how you want the rogue adhocs filtered.

- MAC Address—If you want to view a particular MAC address, enter it in the MAC Address text box.
- State—Use the drop-down list to select from Alert, Known, Acknowledged, Contained, Threat, or Unknown contained states.
- On Network—Use the drop-down list to specify whether or not you want to display rogue adhocs on the network.

Click **OK** when all applicable filtering criteria are selected.

Filtering Rogue Client Floor Settings

If you enable the Rogue Clients floor setting and then click the blue arrow to the right, the Rogue Clients filter dialog appears.

Rogue Clients filtering options include the following:

- Show All Rogue Clients—Select the check box to display all rogue clients on the map.
- Small Icons—Select the check box to display icons for each rogue client on the map.

Note If you select the **Show All Rogue Clients** check box and **Small Icons** check box, all other drop-down list options are dimmed. If you unselect the **Show All Rogue Clients** check box, you can specify how you want the rogue clients filtered.

- Assoc. Rogue AP MAC Address—If you want to view a particular MAC address, enter it in the MAC Address text box.
- State—Use the drop-down list to choose from Alert, Contained, Threat, or Unknown contained states.

Click **OK** when all applicable filtering criteria are selected.

Filtering Interferer Settings

If you enable Interferer floor setting and then click the blue arrow to the right, the Interferers filter dialog box appears.

Interferer filtering options include the following:

- Show active interferers only—Select the check box to display all active interferers.
- Small Icons—Select the check box to display icons for each interferer on the map.
- Show Zone of Impact—Displays the approximate interference impact area. The opacity of the circle denotes its severity. A solid red circle represents a very strong interferer that likely disrupts Wi-Fi communications, a light pink circle represents a weak interferer.
- Click **OK** when all applicable filtering criteria are selected.

Import Map and AP Location Data

When converting from autonomous to lightweight access points and from the WLSE to the NCS, one of the conversion steps is to manually reenter the access point-related information into the NCS. To speed up this process, you can export the information about access points from the WLSE and import it into the NCS.

Note The NCS expects a .tar file and checks for a .tar extension before importing the file. If the file you are trying to import is not a .tar file, the NCS displays an error message and prompts you to import a different file.

Note For more information on the WLSE data export functionality (WLSE Version 2.15), see the following URL:
http://<WLSE_IP_ADDRESS>:1741/debug/export/exportSite.jsp.

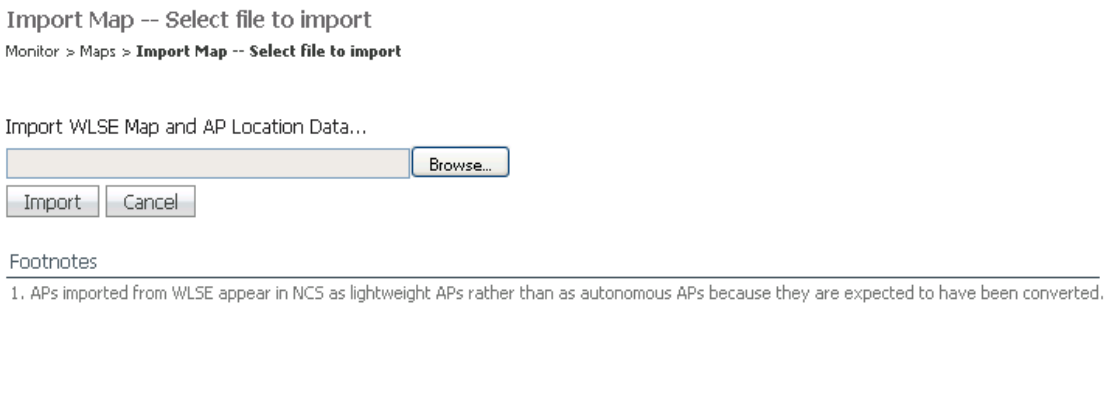
To map properties and import a tar file containing WLSE data using the NCS web interface, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **Import Maps**, and click **Go**.

Step 3 Choose the **WLSE Map and AP Location Data** option, and click **Next**. (See Figure 6-27).

Figure 6-27 Import WLSE Map and AP Location Data



Step 4 In the Import WLSE Map and AP Location Data page, click **Browse** to select the file to import.

Step 5 Find and select the .tar file to import and click **Open**.

The NCS displays the name of the file in the Import From text box.

Step 6 Click **Import**.

The NCS uploads the file and temporarily saves it into a local directory while it is being processed. If the file contains data that cannot be processed, the NCS prompts you to correct the problem and retry. Once the file has been loaded, the NCS displays a report of what is added to the NCS. The report also specifies what cannot be added and why.

If some of the data to be imported already exists, the NCS either uses the existing data in the case of campuses or overwrites the existing data using the imported data in the cases of buildings and floors.

Note If there are duplicate names between a WLSE site and building combination and an NCS campus (or top-level building) and building combination, the NCS displays a message in the Pre Execute Import Report indicating that it will delete the existing building.

Step 7 Click **Import** to import the WLSE data.

The NCS displays a report indicating what was imported.

Step 8 Choose **Monitor > Site Maps** to view the imported data.

Positioning Access Points, Wi-Fi TDOA Receivers, and Chokepoints by Importing or Exporting a File

To change an access point, Wi-Fi TDOA receiver, or chokepoint position, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **Properties**.

Step 3 From the Unit of Dimension drop-down list, choose **feet** or **meters**.

Step 4 Select the Advanced Debug Mode **Enable** radio button.

Step 5 Click **OK**.

Step 6 From the Select a command drop-down list, choose **Export/Import AP/WiFi TDOA Receiver/Chokepoint Placement**.

Step 7 In the Import/Export AP/WiFi TDOA Receiver/Chokepoint Placement page, click **Browse** to find the file you want to import.

Note The file must already be created and added to the NCS.

Note The following is the correct file format:

[BuildingName], [FloorName], [AP/WiFi TDOA Receiver/Chokepoint Name], (aAngle), (bAngle), [X], [Y], ([aAngleElevation, bAngleElevation, Z]), (aAntennaType, aAntennaMode, (aAntennaPattern, (aAntennaGain)), bAntennaType, bAntennaDiversity, (bAntennaPattern, bAntennaGain)))))

The parameters in square brackets are mandatory, and those in parentheses are optional.

Note Angles must be entered in radians (X,Y), and the height is entered in feet. The aAngle and bAngle range is from –2Pi (-6.28...) to 2Pi (6.28...), and the elevation ranges from –Pi (-3.14...) to Pi (3.14...).

Step 8 Click **Import**. The RF calculation takes approximately two seconds per component.

Changing Access Point Positions by Importing and Exporting a File

You can change an access point position by importing or exporting a file. The file contains only the lines describing the access point you want to move. This option takes less time than manually changing multiple access point positions. To change access point positions using the importing or exporting of a file, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose Import AP/WiFi TDOA Receiver/Chokepoint Placement or Export AP/WiFi TDOA Receiver/Chokepoint Placement, and click **Go**.

Step 3 In Import Data from File or Export Data from File, click **Browse** to find the file you want to import. The file in the [BuildingName], [FloorName], [APName], (aAngle), (bAngle), [X], [Y], ([aAngleElevation, bAngleElevation, Z]), (aAntennaType, aAntennaMode, (aAntennaPattern, (aAntennaGain)), bAntennaType, bAntennaDiversity, (bAntennaPattern, bAntennaGain))))) format must already be created and added to NCS. (See the "Inspecting VoWLAN Readiness" section on page 6-79.)

Note The parameters in square brackets are mandatory, and those in parentheses are optional.

Note Angles must be entered in radians (X,Y), and the height is entered in feet. The aAngle and bAngle range is from –2Pi (-6.28...) to 2Pi (6.28...), and the elevation ranges from –Pi (-3.14...) to Pi (3.14...).

Step 4 Click **Import**. The RF calculation takes approximately two seconds per access point.

Configuring ChokePoints

Using chokepoints in conjunction with active compatible extensions compliant tags provides immediate location information on a tag and its asset. When a Cisco Compatible Extension tag moves out of the range of a chokepoint, its subsequent beacon frames do not contain any identifying chokepoint information. Location determination of the tag defaults to the standard calculation methods based on RSSIs reported by the access point associated with the tag.

This section contains the following topics:

Using Chokepoints to Enhance Tag Location Reporting

Installation of chokepoints provides enhanced location information for RFID tags. When an active Cisco Compatible Extensions Version 1-compliant RFID tag enters the range of a chokepoint, it is stimulated by the chokepoint. The MAC address of this chokepoint is then included in the next beacon sent by the stimulated tag. All access points that detect this tag beacon then forward the information to the controller and location appliance.

Using chokepoints in conjunction with active compatible extensions compliant tags provides immediate location information on a tag and its asset. When a Cisco Compatible Extension tag moves out of the range of a chokepoint, its subsequent beacon frames do not contain any identifying chokepoint information. Location determination of the tag defaults to the standard calculation methods based on RSSIs reported by the access point associated with the tag.

Adding Chokepoints to the NCS Database

Chokepoints are installed and configured as recommended by the Chokepoint vendor. After the chokepoint installation is complete and operational, the chokepoint can be entered into the location database and plotted on an NCS map.

To add a chokepoint to the NCS database, follow these steps:

Step 1 Choose **Configure > Chokepoints**.

Step 2 From the Select a command drop-down list, choose **Add Chokepoints**.

Step 3 Click **Go**.

Step 4 Enter the MAC address and name for the chokepoint.

Step 5 Select the **Entry/Exit Chokepoint** check box.

Step 6 Enter the coverage range for the chokepoint.

Note The Chokepoint range is a visual representation only. It is product-specific. The actual range must be configured separately using the applicable chokepoint vendor software.

Step 7 Click **OK**.

Note After the chokepoint is added to the database, it can be placed on the appropriate NCS floor map.

Adding a Chokepoint to an NCS Map

To add the chokepoint to a map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 In the Maps page, choose the link that corresponds to the floor location of the chokepoint.

Step 3 From the Select a command drop-down list, choose **Add Chokepoints**.

Step 4 Click **Go**.

Note The Add Chokepoints summary page lists all recently added chokepoints that are in the database but are not yet mapped.

Step 5 Select the check box next to the chokepoint that you want to place on the map.

Step 6 Click **OK**.

A map appears with a chokepoint icon located in the top left-hand corner. You are now ready to place the chokepoint on the map.

Step 7 Left-click the chokepoint icon and drag it to the proper location.

Note The MAC address, name, and coverage range of the chokepoint appear in the dialog box in the left when you click the chokepoint icon for placement.

Step 8 Click **Save**.

You are returned to the floor map and the added chokepoint appears on the map.

Note The newly created chokepoint icon might or might not appear on the map depending on the display settings for that floor.

Note The rings around the chokepoint icon indicate the coverage area. When a CCX tag and its asset passes within the coverage area, location details are broadcast, and the tag is automatically mapped on the chokepoint coverage circle. When the tag moves out of the chokepoint range, its location is calculated as before and is no longer mapped on the chokepoint rings.

Note The MAC address, name, entry/exit chokepoint, static IP address, and range of the chokepoint appear when you hover your mouse cursor over its map icon.

Step 9 If the chokepoint does not appear on the map, select the **Chokepoints** check box located in the Floor Settings menu.

Note Do not click **Save Settings** unless you want to save this display criteria for all maps.

Note You must synchronize network design to the mobility services engine or location server to push chokepoint information.

Positioning Chokepoints

To position chokepoints on the map, follow these steps:

Step 1 Left-click the **Chokepoint** icon and drag it to the proper location.

Note The MAC address, name, and coverage range of the chokepoint appear in the dialog box in the left when you click the chokepoint icon for placement.

Step 2 Click **Save** when the icon is correctly placed on the map.

Step 3 The newly created chokepoint icon might or might not appear on the map depending on the display settings for that floor. If the icon does not appear, repeat Step 11.

Note The rings around the chokepoint icon indicate the coverage area. When a Cisco Compatible Extensions tag and its asset passes within the coverage area, location details are broadcast, and the tag is automatically mapped on the chokepoint coverage circle. The chokepoint range is provided as a visual only, but chokepoint vendor software is required to actually configure the range. When the tag moves out of the chokepoint range, its location is calculated as before and is no longer mapped on the chokepoint rings.

Note The MAC address, name, and range of a chokepoint are displayed when you hover your mouse cursor over its map icon.

Step 4 If the chokepoint does not appear on the map, choose **Layers** to view a drop-down list of possible elements to display on the map. Select the **Chokepoints** check box.

Step 5 Click **X** to close the Layers page.

Note Do not click **Save Settings** unless you want to save this display criteria for all maps.

Note You can change the position of chokepoints by importing or exporting a file. See the "Positioning Access Points, Wi-Fi TDOA Receivers, and Chokepoints by Importing or Exporting a File" section on page 6-56 for more information.

Removing Chokepoints from the NCS Database and Map

You can remove one or multiple chokepoints at a time.

To delete a chokepoint, follow these steps:

Step 1 Choose **Configure > Chokepoints**:

Step 2 Select the box(es) next to the chokepoint(s) to be deleted.

Step 3 From the Select a command drop-down list, choose **Remove Chokepoints**.

Step 4 Click **Go**.

Step 5 Click **OK** to confirm the chokepoint deletion.

Step 6 From the Select a command drop-down list in the applicable NCS floor map page, choose **Remove Chokepoints**.

Step 7 Click **Go**.

Step 8 Select the check box(es) next to the chokepoint(s) to be deleted.

Step 9 Click **OK**.

Configuring Wi-Fi TDOA Receivers

This section contains the following topics:

Adding Wi-Fi TDOA Receivers to the NCS Database

To add Wi-Fi TDOA receivers to the NCS database, follow these steps:

Step 1 Choose **Configure > WiFi TDOA Receivers**.

Step 2 From the Select a command drop-down list, choose **Add WiFi TDOA Receivers**.

Step 3 Click **Go**.

Step 4 Enter the MAC address, name, and static IP address for the Wi-Fi TDOA receiver.

Note Wi-Fi TDOA receivers are configured separately using the Wi-Fi TDOA receiver vendor software.

Step 5 Click **OK** to save the Wi-Fi TDOA receiver entry to the database.

Note After the Wi-Fi TDOA receiver is added to the database, place it on the appropriate NCS floor map. See the "Adding Wi-Fi TDOA Receivers to the NCS Database" section on page 6-62 for more information.

Adding Wi-Fi TDOA Receivers to a Map

To add a **WiFi TDOA** receiver to a map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Choose the link that corresponds to the floor location of the Wi-Fi TDOA receiver.

Step 3 From the Select a command drop-down list, choose **Add WiFi TDOA Receivers**.

Step 4 Click **Go**.

Note The Add WiFi TDOA Receivers summary page lists all recently added Wi-Fi TDOA receivers that are in the database but are not yet mapped.

Step 5 Select the check box next to the Wi-Fi TDOA receiver to be added to the map.

Step 6 Click **OK**.

A map appears with a green WiFi TDOA receiver icon located in the top left-hand corner. You are now ready to position the Wi-Fi TDOA receiver on the map.

Positioning Wi-Fi TDOA Receivers

To position Wi-Fi TDOA receivers on the map, follow these steps:

Step 1 Left-click the **WiFi TDOA receiver** icon and drag it to the proper location.

Note The MAC address and name of the Wi-Fi TDOA receiver appear in the left pane when you click the WiFi TDOA receiver icon for placement.

Step 2 Click **Save** when the icon is correctly placed on the map.

Note The MAC address of the Wi-Fi TDOA receiver appears when you hover your mouse cursor over its map icon.

Step 3 If the chokepoint does not appear on the map, click **Layers** to view a drop-down list of possible elements to display on the map. Select the **WiFi TDOA Receivers** check box.

Step 4 Click **X** to close the Layers page.

Note Do not select **Save Settings** unless you want to save this display criteria for all maps.

Note You can change the position of Wi-Fi TDOA Receivers by importing or exporting a file. See the "Positioning Access Points, Wi-Fi TDOA Receivers, and Chokepoints by Importing or Exporting a File" section on page 6-56 for more information.

Removing Wi-Fi TDOA Receivers from the Map

To remove a Wi-Fi TDOA receiver from a floor map, follow these steps:

Step 1 From the Select a command drop-down list in the applicable NCS floor map page, choose **Remove WiFi TDOA Receivers**.

Step 2 Click **Go**.

Step 3 Select the check box(es) next to the Wi-Fi TDOA receiver(s) to be deleted.

Note You can remove multiple Wi-Fi TDOA receivers at a time from a map.

Step 4 Click **OK**.

Removing Wi-Fi TDOA Receivers from the NCS Database

To remove a Wi-Fi TDOA receiver from the NCS database, follow these steps:

Step 1 Choose **Configure > WiFi TDOA Receivers**.

Step 2 Select the check box(es) next to the Wi-Fi TDOA receiver(s) to be deleted.

Note You can remove multiple Wi-Fi TDOA receivers at a time from the database.

Step 3 From the Select a command drop-down list, choose **Remove WiFi TDOA Receivers**.

Step 4 Click **Go**.

Step 5 Click **OK** to confirm the deletion.

Managing RF Calibration Models

If the provided RF models do not sufficiently characterize the floor layout, you can create a calibration model that is applied to the floor and better represents the attenuation characteristics of that floor. The calibration models are used as RF overlays with measured RF signal characteristics that can be applied to different floor areas. This enables the Cisco WLAN solution installation team to lay out one floor in a multi-floor area, use the RF calibration tool to measure, save the RF characteristics of that floor as a new calibration model, and apply that calibration model to all the other floors with the same physical layout.

You can collect data for a calibration using one of two methods:

- Point mode data collection—Calibration points are selected and their coverage area is calculated one location at a time.
- Linear mode data collection—A series of linear paths are selected and then calculated as you traverse the path. This approach is generally faster than the point mode data collection. You can also employ point mode data collection to augment data collection for locations missed by the linear paths.

Note Calibration models can only be applied to clients, rogue clients, and rogue access points. Calibration for tags is done using the Aeroscout System Manager. See the following URL for details on tag calibration at: http://support.aeroscout.com.

Note We recommend client device that supports both 802.11a/n and 802.11b/g/n radios to expedite the calibration process for both spectrums.

Use a laptop or other wireless device to open a browser to the NCS server and perform the calibration process.

This section contains the following topics:

- Apply the Model to the Floor, page 6-69
- Deleting Calibration Models, page 6-69

Accessing Current Calibration Models

To access current calibration models, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **RF Calibration Models**. The Model Name and Status for each calibration model are listed.

Step 3 Click the model name to access a specific calibration model.

Applying Calibration Models to Maps

To apply a current calibration model to a map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **RF Calibration Models**.

Step 3 Click the model name to access the applicable calibration model.

Step 4 From the Select a command drop-down list, choose **Apply to Maps**.

Step 5 Click **Go**.

Viewing Calibration Model Properties

To view or edit current calibration models, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **RF Calibration Models**.

Step 3 Click the model name to access the applicable calibration model.

Step 4 From the Select a command drop-down list, choose **Properties**.

Step 5 Click **Go** to view or edit calibration model details. See the "Viewing Calibration Model Properties" section on page 6-65 for more information.

Viewing Calibration Model Details

To edit calibration model details, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **RF Calibration Models**.

Step 3 Click the model name to access the applicable calibration model.

Step 4 From the Select a command drop-down list, choose **Properties**.

Step 5 Click **Go**.

Step 6 The following parameters might be edited:

- Sweep Client Power for Location—Click to enable. You might want to enable this if a high density of access points exists and transmit power is reduced or unknown. The sweeping range of client transmit power might improve accuracy but scalability is negatively affected.
- HeatMap Binsize—Choose **4**, **8**, **16**, or **32** from the drop-down list.
- HeatMap Cutoff—Determine the heatmap cutoff. We recommend a low heatmap cutoff especially if the access point density is high and RF propagation conditions are favorable. A higher cutoff value increases scalability but might cause difficulty when locating clients.

Step 7 When any necessary changes have been made or to exit the page, click **OK**.

Creating New Calibration Models

To create a new calibration model, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 From the Select a command drop-down list, choose **RF Calibration Models**.

Step 3 Click **Go**.

Step 4 From the Select a command drop-down list, choose **Create New Model**.

Step 5 Click **Go**.

Step 6 Enter a model name, and click **OK**.

The new model appears along with the other RF calibration models with a status of Not Yet Calibrated.

Starting Calibration Process

To start the calibration process, follow these steps:

Step 1 Click the model name to open the Calibration Model > Model Name page.

Step 2 From the Select a command drop-down list, choose **Add Data Points**.

Step 3 Click **Go**.

Step 4 Enter the MAC address of the device being used to perform the calibration. Manually-entered MAC addresses must be delimited with colons (such as FF:FF:FF:FF:FF:FF).

Note If this process is being performed from a mobile device connected to the NCS through the Cisco Centralized architecture, the MAC address text box is automatically populated with the device address.

Step 5 Choose the appropriate campus, building, floor, or outdoor area where the calibration is performed.

Note The calibration in the outdoor area is supported in Release 1.0.x and later. You can use this option to add the calibration data points to the outdoor area. The data points can be added to the outdoor area using the same procedure for calibration.

Step 6 Click **Next**.

Step 7 When the chosen floor map and access point locations appear, a grid of plus marks (+) indicates the locations where data collection for calibration is performed.

Using these locations as guidelines, you can perform either a point or linear collection of data by appropriate placement of either the Calibration Point pop-up (point) or the Start and Finish pop-ups (linear) that appear on the map when the respective options are displayed.

If you want to perform a point collection of data for the calibration, do the following:

a. Choose **Point** from the Collection Method drop-down list and select the **Show Data points** check box if not already selected. A calibration point pop-up appears on the map.

b. Position the tip of the calibration point pop-up at a data point (+), and click **Go**. A dialog box appears showing the progress of the data collection.

Note Rotate the calibrating client laptop during data collection so that the client is heard evenly by all access points in the vicinity.

c. When the data collection is complete for a selected data point and the coverage area is plotted on the map, move the calibration point pop-up to another data point, and click **Go**.

Note The coverage area plotted on the map is color-coded and corresponds with the specific wireless LAN standard used to collect that data. Information on color-coding is provided in legend on the left side of the page. Additionally, the progress of the calibration process is indicated by two status bars above the legend, one for 802.11a/n and one for 802.11b/g/n.

Note To delete data points for locations selected in error, click **Delete** and move the black square that appears over the appropriate data points. Resize the square as necessary by pressing **Ctrl** and moving the mouse.

d. Repeat point collection Steps a. to c. until the calibration status bar of the relevant spectrums (802.11a/n, 802.11b/g/n) display as ‘done.’

Note The calibration status bar indicates data collection for the calibration as done after roughly 50 distinct locations and 150 measurements have been gathered. For every location point saved in the calibration process, more than one data point is gathered. The progress of the calibration process is indicated by two status bars above the legend, one for 802.11b/g/n and one for 802.11a/n.

If you want to perform a linear collection of data for the calibration, do the following:

a. Choose **Linear** from the Collection Method drop-down list, and select the **Show Data points** check box if not already selected. A line appears on the map with both Start and Finish pop-ups.

b. Position the tip of the Start pop-up at the starting data point.

c. Position the Finish pop-up at the ending data point.

d. Position yourself with your laptop at the starting data point, and click **Go**. Walk steadily towards the end point along the defined path. A dialog box appears to show that data collection is in process.

Note Do not stop data collection until you reach the end point even if the data collection bar indicates completion.

Note Only Intel and Cisco adapters have been tested. Make sure Enable Cisco Compatible Extensions and Enable Radio Management Support are enabled in the Cisco Compatible Extension Options.

e. Press the space bar (or Done on the data collection panel) when you reach the end point. The collection pane displays the number of samples taken before it closes to reveal the map. The map displays all the coverage areas where data was collected.

Note To delete data points for locations selected in error, click **Delete** and move the black square that appears over the appropriate data points. Resize the square as necessary by pressing the **Ctrl** and moving the mouse.

Note The coverage area is color-coded and corresponds with the specific wireless LAN standard used to collect that data. Information on color-coding is provided in legend on the left-hand side of the page.

f. Repeat linear collection Steps b to e until the status bar for the respective spectrum is filled in (done).

Note You can augment linear collection with point mode data collection to address missed coverage areas.

Step 8 Click the name of the calibration model at the top of the page to return to the main page for that model to calibrate the data points.

Step 9 Choose **Calibrate** from the Select a command drop-down list, and click **Go**.

Step 10 Click the **Inspect Location Quality** link when calibration completes. A map displays showing RSSI readings displays.

Step 11 To use the newly created calibration model, you must apply the model to the floor on which it was created (and on any other floors with similar attenuation characteristics as well). Choose **Monitor > Site Maps** and find the specific floor to which the model is applied. At the floor map interface, choose **Edit Floor Area** from the drop-down list, and click **Go**.

Step 12 From the Floor Type (RF Model) drop-down list, choose the newly created calibration model. Click **OK** to apply the model to the floor.

Note This process can be repeated for as many models and floors as needed. After a model is applied to a floor, all location determination performed on that floor is done using the specific collected attenuation data from the calibration model.

Calibrating

To compute the collected data points, follow these steps:

Step 1 Click the model name to open the Calibration Model > Model Name page.

Step 2 In the Calibration Model > Model Name page, choose **Calibrate** from the Select a command drop-down list.

Step 3 Click **Go**.

Apply the Model to the Floor

To use the newly created calibration model, you must apply the model to the floor on which it was created (along with other floors with similar attenuation characteristics).

To apply the model to the floor, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Locate the specific floor to which the model is applied.

Step 3 From the Select a command drop-down list, choose **Edit Floor Area**.

Step 4 Click **Go**.

Step 5 From the Floor Type (RF Model) drop-down list, choose the newly-created calibration model.

Step 6 Click **OK** to apply the model to the floor.

This process can be repeated for as many models and floors as needed. After a model is applied to a floor, all location determination performed on that floor is done using the specific collected attenuation data from the calibration model.

Deleting Calibration Models

To delete a calibration model, follow these steps:

Step 1 Click the model name to open the Calibration Model > Model Name page.

Step 2 From the Select a command drop-down list, choose **Delete Model**.

Step 3 Click **Go**.

Managing Location Presence Information

You can enable location presence through mobility services engine to provide expanded Civic (city, state, postal code, country) and GEO (longitude, latitude) location information beyond the Cisco default setting (campus, building, floor, and X, Y coordinates). This information can then be requested by clients on a demand basis for use by location-based services and applications. See the "Enabling Location Presence for Mobility Services" section on page 16-54 for more information on enabling location presence.

To view or edit current location presence information for a current map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the check box of the map.

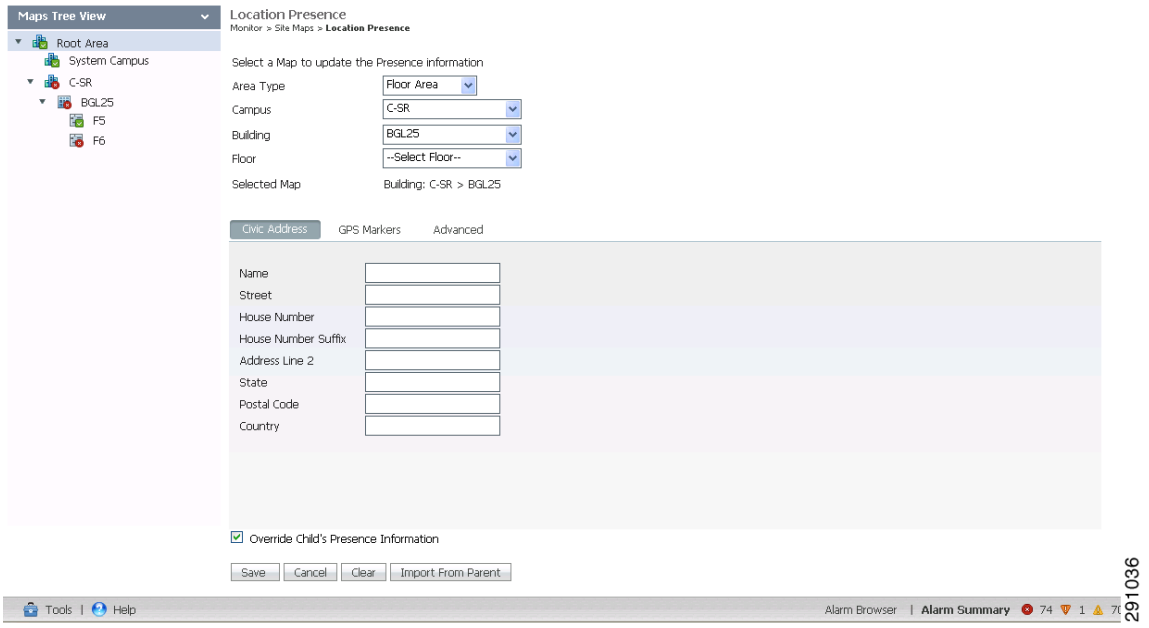
Step 3 From the Select a command drop-down list, choose **Location Presence**.

Step 4 Click **Go**.

The Location Presence page appears. (See Figure 6-28).

Note The current map location information (Area Type, Campus, Building, and Floor) see the map you selected in the **Monitor > Site Maps** page. To select a different map, use the Select a Map to Update Presence Information drop-down lists to choose the new map location.

Figure 6-28 Location Presence



Step 5 Click the **Civic Address**, **GPS Markers**, or **Advanced** tab.

- Civic Address—Identifies the campus, building, or floor by name, street, house number, house number suffix, city (address line2), state, postal code, and country.
- GPS Markers—Identify the campus, building, or floor by longitude and latitude.

– Advanced—Identifies the campus, building, or floor with expanded civic information such as neighborhood, city division, county, and postal community name.

Note Each selected field is inclusive of all of those above it. For example, if you select Advanced, it can also provide GPS and Civic location information upon client demand. The selected setting must match what is set on the mobility services engine level. See the Enabling Location Presence for Mobility Services, page 16-54 for more information.

Note If a client requests location information such as GPS Markers for a campus, building, floor, or outdoor area that is not configured for that field, an error message appears.

Note By default, the Override Child Element Presence Info check box is selected.

Searching Maps

You can use the following parameters in the Search Maps page:

- Search for
- Map Name
- Search in
- Save Search
- Items per page

After you click **Go**, the map search results page appears (see Table 6-7).

Table 6-7 Map Search Results

Field	Options
Name	Clicking an item in the Name column provides a map of an existing building with individual floor area maps for each floor.
Type	Campus, building, or floor area.
Total APs	Displays the total number of Cisco Radios detected.
a/n Radios	Displays the number of 802.11a/n Cisco Radios.
b/g/n Radios	Displays the number of 802.11b/g/n Cisco Radios.

Using the Map Editor

You can use the NCS map editor to define, draw, and enhance floor plan information. This section contains the following topics:

Opening the Map Editor

Follow these steps to use the map editor:

Step 1 Choose **Monitor > Site Maps** to display the Maps page.

Step 2 Click the desired campus. The Site Maps > Campus Name page appears.

Step 3 Click a campus and then click a building.

Step 4 Click the desired floor area. The Site Maps > Campus Name > Building Name > Floor Area Name page appears.

Step 5 From the Select a command drop-down list, choose **Map Editor**, and click **Go**. The Map Editor page appears.

Note Make sure that the floor plan images are properly scaled so that all white space outside of the external walls is removed. To make sure that floor dimensions are accurate, click the **compass tool** on the toolbar.

Step 6 Position the reference length. When you do, the Scale menu appears with the line length supplied. Enter the dimensions (width and height) of the reference length, and click **OK**.

Step 7 Determine the propagation pattern from the Antenna Mode drop-down list.

Step 8 Make antenna adjustments by sliding the antenna orientation bar to the desired degree of direction.

Step 9 Choose the desired access point.

Step 10 Click **Save**.

Using the Map Editor to Draw Polygon Areas

If you have a building that is non-rectangular or you want to mark a non-rectangular area within a floor, you can use the map editor to draw a polygon-shaped area.

Step 1 Add the floor plan if it is not already represented in NCS (see the "Adding Floor Areas to a Campus Building" section on page 6-28).

Step 2 Choose **Monitor > Site Maps**.

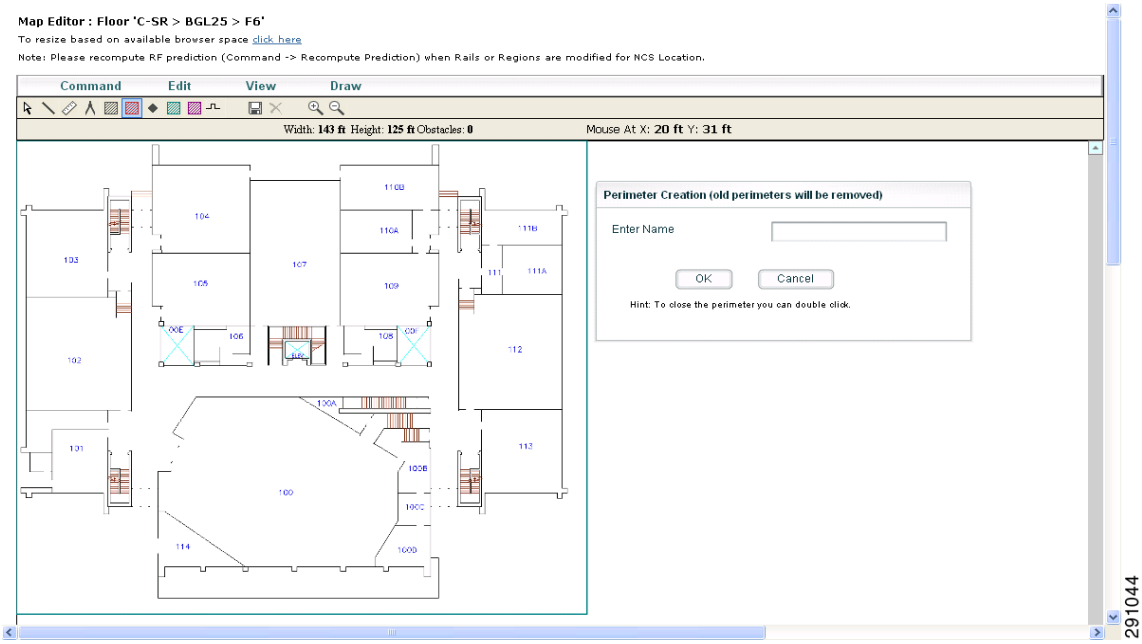
Step 3 Click the Map Name that corresponds to the outdoor area, campus, building, or floor you want to edit.

Step 4 From the Select a command drop-down list, choose **Map Editor**, and click **Go**.

Step 5 It the Map Editor page, click the **Add Perimeter** icon on the toolbar (see Figure 6-29).

A pop-up appears.

Figure 6-29 Map Editor Page



Step 6 Enter the name of the area that you are defining. Click **OK**.

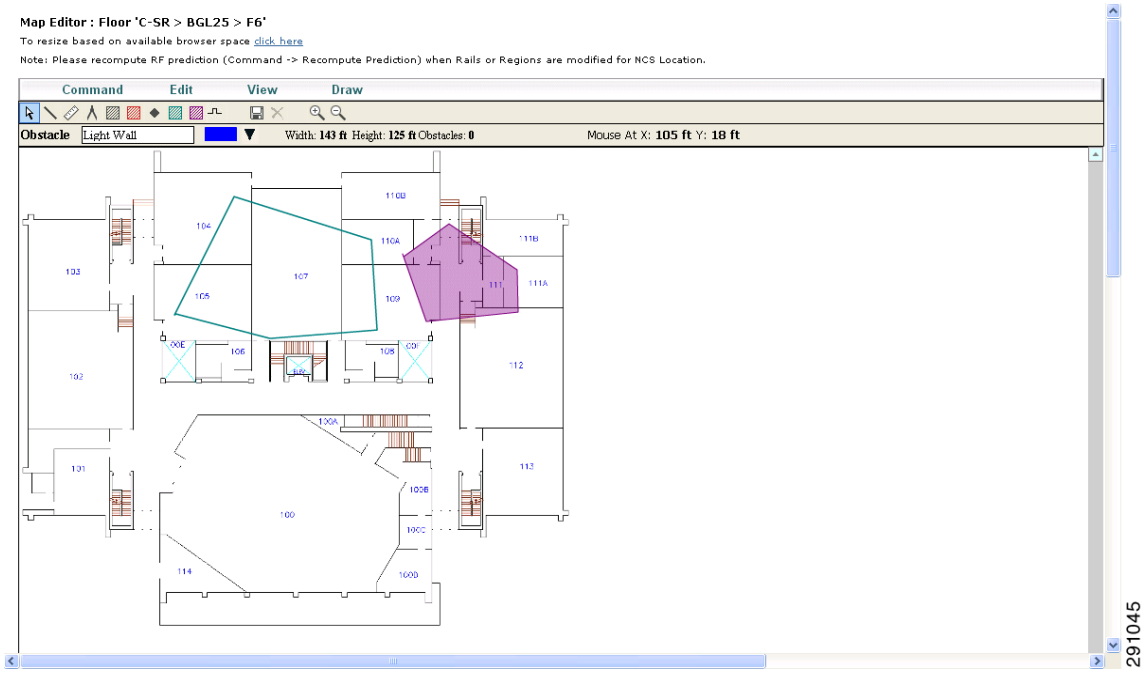
A drawing tool appears.

Step 7 Move the drawing tool to the area you want to outline.

- Click the left mouse button to begin and end drawing a line.
- When you have completely outlined the area, double-click the left mouse button and the area is highlighted in the page (see Figure 6-30).

The outlined area must be a closed object to appear highlighted on the map.

Figure 6-30 Polygon Area



Step 8 Click the disk icon on the toolbar to save the newly drawn area.

Step 9 Choose **Command > Exit** to close the window. You are returned to the original floor plan.

Note When you return to the original floor plan view after exiting the map editor, the newly drawn area is not visible; however, it appears in the Planning Model page when you add elements.

Step 10 Choose **Planning Mode** from the Select a command drop-down list to begin adding elements to the newly defined polygon-shaped area.

The Table 6-8 describes the obstacle color coding.

Table 6-8 Obstacle Color Coding

Type of obstacle	Color coding	Loss (in dB)
Thick wall		13
Light wall		2
Heavy door		15
Light door		4
Cubicle		1
Glass		1.5

Note The RF prediction heatmaps for access points approximates of the actual RF signal intensity. It takes into account the attenuation of obstacles drawn using the Map Editor but it does not take into account the attenuation of various building materials, such as drywall or metal objects, nor does it display the effects of RF signals bouncing off obstructions. The thick wall (color-coded orange) with a loss of 13 dB might not be enough to contain the RF signal beyond the walls of the heatmap.

Defining an Inclusion Region on a Floor

To define an inclusion area, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the appropriate floor area.

Step 3 From the Select a command drop-down list, choose **Map Editor**.

Step 4 Click **Go**.

Step 5 At the map, click the aqua box on the toolbar.

Note A message box appears reminding you that only one inclusion area can be defined at a time. Defining a new inclusion region automatically removes the previously defined inclusion region. By default, an inclusion region is defined for each floor when it is added to the NCS. The inclusion region is indicated by a solid aqua line and generally outlines the region.

Step 6 Click **OK** in the message box that appears. A drawing icon appears to outline the inclusion area.

Step 7 To begin defining the inclusion area, move the drawing icon to a starting point on the map and click once.

Step 8 Move the cursor along the boundary of the area you want to include and click to end a border line. Click again to define the next boundary line.

Step 9 Repeat Step 8 until the area is outlined and then double-click the drawing icon. A solid aqua line defines the inclusion area.

Step 10 Choose **Save** from the Command menu or click the **disk** icon on the toolbar to save the inclusion region.

Note If you made an error in defining the inclusion area, click the area. The selected area is outlined by a dashed aqua line. Next, click the **X** icon on the toolbar. The area is removed from the floor map.

Step 11 To return to the floor map to enable inclusion regions on heatmaps, choose **Exit** from the Command menu.

Step 12 Select the **Location Regions** check box if it is not already selected. If you want it to apply to all floor maps, click **Save settings**. Close the Layers configuration page.

Step 13 To resynchronize the NCS and MSE databases, choose **Services > Synchronize Services**.

Note If the two DBs are already synchronized then a resynchronization happens automatically every time there is a change. There is no need for an explicit resynch.

Step 14 In the Synchronize page, choose **Network Designs** from the Synchronize drop-down list and then click **Synchronize**.

You can confirm that the synchronization is successful by viewing two green arrows in the Sync. Status column.

Note Newly defined inclusion and exclusion regions appear on heatmaps only after the mobility services engine recalculates location.

Defining an Exclusion Region on a Floor

To further refine location calculations on a floor, you can define areas that are excluded (exclusion areas) in the calculations. For example, you might want to exclude areas such as an atrium or stairwell within a building. As a rule, exclusion areas are generally defined within the borders of an inclusion area.

To define an exclusion area, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the appropriate floor area.

Step 3 From the Select a command drop-down list, choose **Map Editor**.

Step 4 Click **Go**.

Step 5 At the map, click the purple box on the toolbar.

Step 6 Click **OK** in the message box that appears. A drawing icon appears to outline the exclusion area.

Step 7 To begin defining the exclusion area, move the drawing icon to the starting point on the map, and click once.

Step 8 Move the drawing icon along the boundary of the area you want to exclude. Click once to start a boundary line, and click again to end the boundary line.

Step 9 Repeat Step 8 until the area is outlined and then double-click the drawing icon. The defined exclusion area is shaded in purple when the area is completely defined. The excluded area is shaded in purple.

Step 10 To define additional exclusion regions, repeat Step 5 to Step 9.

Step 11 When all exclusion areas are defined, choose **Save** from the Command menu or click the **disk** icon on the toolbar to save the exclusion region.

Note To delete an exclusion area, click the area to be deleted. The selected area is outlined by a dashed purple line. Next, click the **X** icon on the toolbar. The area is removed from the floor map.

Step 12 To return to the floor map to enable exclusion regions on heatmaps, choose **Exit** from the Command menu.

Step 13 Select the **Location Regions** check box if it is not already selected, click **Save setting**s, and close the Layers configuration page when complete.

Step 14 To resynchronize the NCS and location databases, choose **Services > Synchronize Services**.

Step 15 In the Synchronize page, choose **Network Designs** from the Synchronize drop-down list and then click **Synchronize**.

You can confirm that the synchronization is successful by viewing two green arrows in the Sync. Status column.

Defining a Rail Line on a Floor

You can define a rail line on a floor that represents a conveyor belt. Additionally, you can define an area around the rail area known as the snap-width to further assist location calculations. This represents the area in which you expect clients to appear. Any client located within the snap-width area is plotted on the rail line (majority) or just outside of the snap-width area (minority).

Note Rail line configurations do not apply to tags.

The snap-width area is defined in feet or meters (user-defined) and represents the distance that is monitored on either side (east and west or north and south) of the rail.

To define a rail with a floor, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the name of the appropriate floor area.

Step 3 Choose **Map Editor** from the Select a command drop-down list.

Step 4 Click **Go**.

Step 5 In the map, click the **rail** icon (to the right of the purple exclusion icon) on the toolbar.

Step 6 In the message dialog box that appears, enter a snap-width (feet or meters) for the rail and then click **OK**. A drawing icon appears.

Step 7 Click the **drawing** icon at the starting point of the rail line. Click again when you want to stop drawing the line or change the direction of the line.

Step 8 Click the **drawing** icon twice when the rail line is completely drawn on the floor map. The rail line appears on the map and is bordered on either side by the defined snap-width region.

Note To delete a rail line, click the area to be deleted. The selected area is outlined by a dashed purple line. Next, click the X icon on the toolbar. The area is removed from the floor map.

Step 9 To return to the floor map to enable rails on heatmaps, choose **Exit** from the Command menu.

Step 10 At the floor map, choose the **Layers** drop-down list.

Step 11 Select the **Rails** check box for if it is not already selected, click **Save settings**, and close the Layers configuration panel when complete.

Step 12 To resynchronize the NCS and mobility services engine, choose **Services > Synchronize Services**.

Step 13 In the Synchronize page, choose **Network Designs** from the Synchronize drop-down list and then click **Synchronize**.

You can confirm that the synchronization is successful by viewing two green arrows in the Sync. Status column.

Inspecting Location Readiness and Quality

You can configure the NCS to verify the ability of the existing access point deployment to estimate the true location of a client, rogue client, rogue access point, or tag within 10 meters at least 90% of the time. The location readiness calculation is based on the number and placement of access points.

You can also check the location quality and the ability of a given location to meet the location specification (10 m, 90%) based on data points gathered during a physical inspection and calibration.

Inspecting Location Readiness

The Inspect Location Readiness feature is a distance-based predictive tool that can point out problem areas with access point placement.

To access the Inspect Location Readiness tool, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the applicable floor area name to view the map.

Note If RSSI is not displayed, you can enable AP Heatmaps by selecting the AP Heatmaps check box on the left sidebar menu.

Note If clients, tags, and access points are not displayed, verify that their respective check boxes are selected on the left sidebar menu. Licenses for both clients and tags must also be purchased for each to be tracked.

Step 3 From the Select a command drop-down list, choose **Inspect Location Readiness**.

Step 4 Click **Go**.

A color-coded map appears showing those areas that meet (indicated by Yes) and do not meet (indicated by No) the ten meter, 90% location specification.

Inspecting Location Quality Using Calibration Data

After completing a calibration model based on data points generated during a physical tour of the area, you can inspect the location quality of the access points.

To inspect location quality based on calibration, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Choose **RF Calibration Model** from the Select a command list. Click **Go**.

A list of calibration models appears.

Step 3 Click the appropriate calibration model.

Details on the calibration including date of last calibration, number of data points by signal type (802.11a, 802.11 b/g) used in the calibration, location, and coverage are displayed.

Step 4 In the same page, click the **Inspect Location Quality** link found under the Calibration Floors heading.

A color-coded map noting percentage of location errors appears.

Note You can modify the distance selected to see the effect on the location errors.

Inspecting VoWLAN Readiness

The VoWLAN Readiness (voice readiness) tool allows you to check the RF coverage to determine if it is sufficient for your voice needs. This tool verifies RSSI levels after access points have been installed.

To access the VoWLAN Readiness Tool (VRT), follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the applicable floor area name.

Step 3 From the Select a command drop-down list, choose **Inspect VoWLAN Readiness**.

Step 4 Choose the applicable **Band**, **AP Transmit Power**, and **Client** parameters from the drop-down lists.

Note By default, the region map displays the b/g/n band for Cisco Phone-based RSSI threshold. The new settings cannot be saved.

Step 5 Depending on the selected client, the following RSSI values might not be editable:

- Cisco Phone—RSSI values are not editable.
- Custom—RSSI values are editable with the following ranges:
  - Low threshold between -95dBm to -45dBm
  - High threshold between -90dBm to -40dBm

Step 6 The following color schemes indicate whether or not the area is voice ready:

- Green—Yes
- Yellow—Marginal
- Red—No

Note The accuracy of the Green/Yellow/Red regions depends on the RF environment and whether or not the floor is calibrated. If the floor is calibrated, the accuracy of the regions is enhanced.

Troubleshooting Voice RF Coverage Issues

- Floors with either calibration or no calibration data are treated as follows:
  - Set the AP Transmit field to **Max** (the maximum downlink power settings). If the map still shows some yellow or red regions, more access points are required to cover the floor.
  - If the calibrated model shows red or yellow regions (where voice is expected to be deployed) with the AP Transmit field set to Current, increasing the power level of the access points might help.

Monitoring Mesh Networks Using Maps

You can access and view details for the following elements from a mesh network map in the NCS:

- Mesh Link Statistics
- Mesh Access Points
- Mesh Access Point Neighbors

Details on how this information is accessed and displayed for each of these items is detailed in this section. This section contains the following topics:

Monitoring Mesh Link Statistics Using Maps

You can view the SNR for a specific mesh network link, view the number of packets transmitted and received on that link, and initiate a link test in the **Monitor > Site Maps** page.

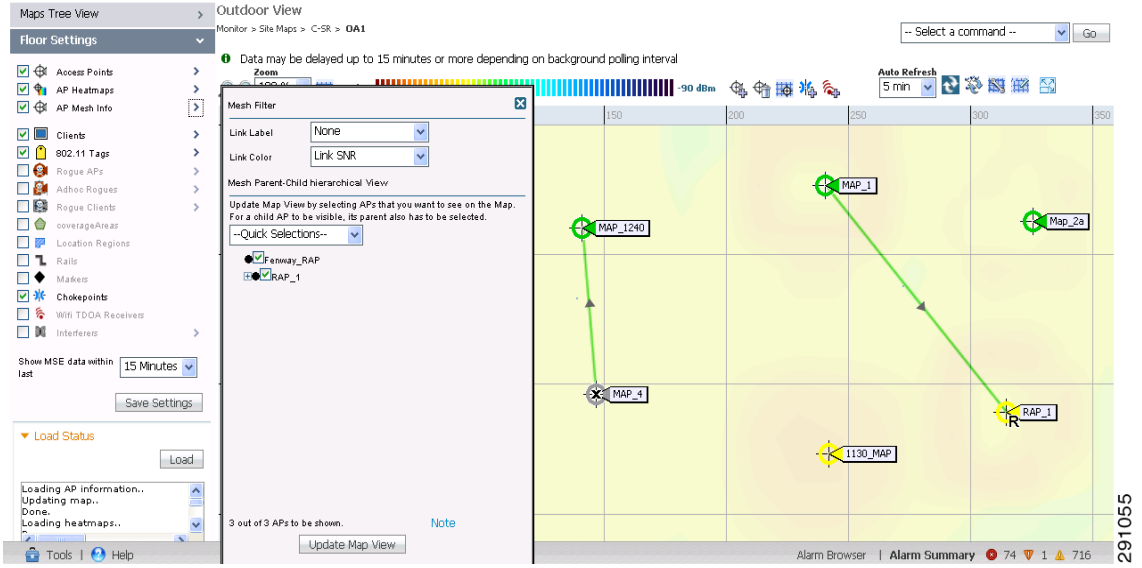
To view details on a specific mesh link between two mesh access points or a mesh access point and a root access point, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the map name that corresponds to the outdoor area, campus, building, or floor you want to monitor.

Step 3 From the left sidebar menu, click the arrow to the right of AP Mesh Info (see Figure 6-31). The Mesh Filter dialog box appears.

Figure 6-31 Mesh Filter Dialog Box



Step 4 Move the cursor over the colored dot next to each mesh access point child to view details on the link between it and its parent. Table 6-9 summarizes the parameters that appear.

The color of the dot also provides a quick reference point of the SNR strength as follows:

- A green dot represents a high SNR (above 25 dB).
- An amber dot represents an acceptable SNR (20-25 dB).
- A red dot represents a low SNR (below 20 dB).
- A black dot indicates a root access point.

The Bridging Link information appears.

Table 6-9 Bridging Link Information

Field	Description
Information fetched on	Date and time that information was compiled.
Link SNR	Link signal-to-noise ratio (SNR).
Link Type	Hierarchical link relationship.
SNR Up	Signal-to-noise radio for the uplink (dB).
SNR Down	Signal-to-noise radio for the downlink (dB).
PER	The packet error rate for the link.
Tx Parent Packets	The TX packets to a node while acting as a parent.
Rx Parent Packets	The RX packets to a node while acting as a parent.
Time of Last Hello	Date and time of last hello.

Step 5 Click either Link Test, Child to Parent or Link Test, Parent to Child. After the link test is complete, a results page appears.

Note A link test runs for 30 seconds.

Note You cannot run link tests for both links (child-to-parent and parent-to-child) at the same time.

Step 6 To view a graphical representation of SNR statistics over a period of time, click the arrow on the link. A page with multiple SNR graphs appears.

The following graphs are displayed for the link:

- SNR Up—Plots the RSSI values of the neighbor from the perspective of the access point.
- SNR Down—Plots the RSSI values that the neighbor reports to the access point.
- Link SNR—Plots a weighed and filtered measurement based on the SNR Up value.
- The Adjusted Link Metric—Plots the value used to determine the least cost path to the root access point. This value represents the ease of getting the rooftop access point and accounts for the number of hops. The lower the ease value, the less likely the path is used.
- The Unadjusted Link Metric—Plots the least cost path to get to the root access point unadjusted by the number of hops. The higher the value for the unadjusted link, the better the path.

Monitoring Mesh Access Points Using Maps

You can view the following summary information for a mesh access point from a mesh network map:

- Parent
- Number of children
- Hop count
- Role
- Group name
- Backhaul interface
- Data Rate
- Channel

Note This information is in addition to the information shown for all access points (MAC address, access point model, controller IP address, location, height of access point, access point uptime, and LWAPP uptime).

Note You can also view detailed configuration, and access alarm, and event information from the map. For detailed information on the Alarms and Events displayed, see the "Alarm and Event Dictionary" section on page 13-1.

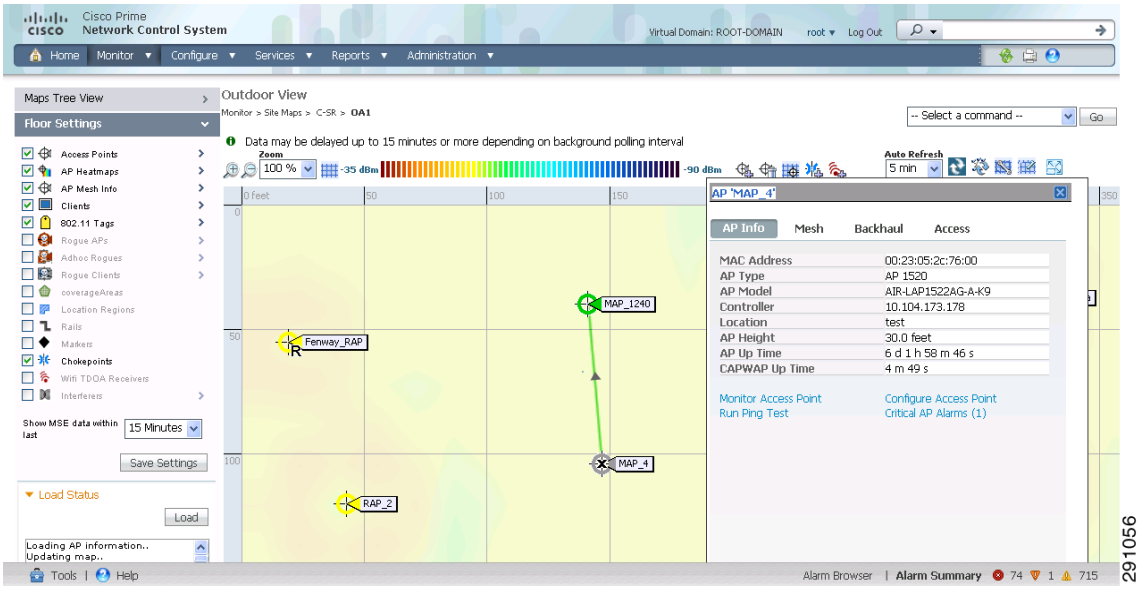
To view summary and detailed configuration information for a mesh access point from a mesh network map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the map name that corresponds to the outdoor area, campus, building, or floor location of the access point you want to monitor.

Step 3 To view summary configuration information for an access point, hover your mouse cursor over the access point that you want to monitor. A dialog box with configuration information for the selected access point appears (see Figure 6-32).

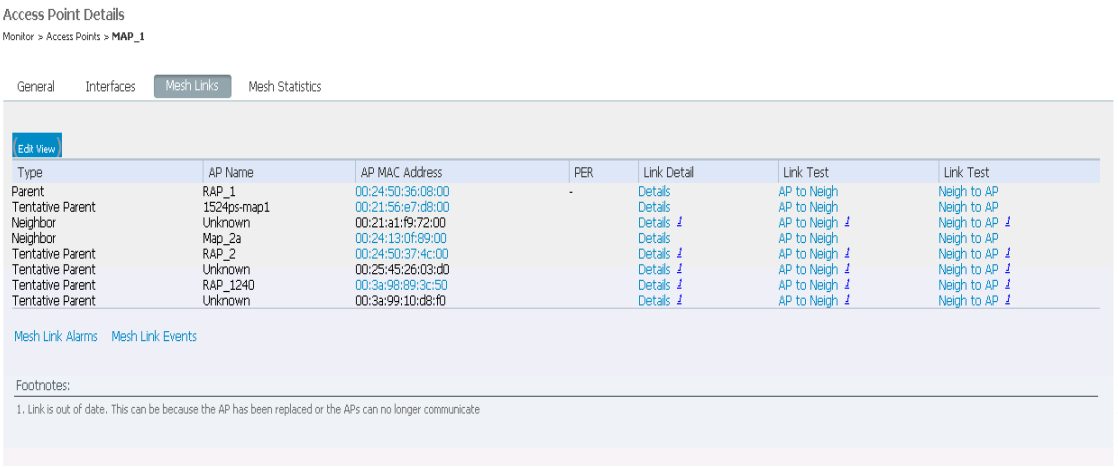
Figure 6-32 Mesh AP Summary Dialog Box



Step 4 To view detailed configuration information for an access point, double-click the access point appearing on the map. The configuration details for the access point appear (see Figure 6-33).

Note For more details on the View Mesh Neighbors link in the access point dialog box (see Figure 6-32), see the "Monitoring Mesh Access Point Neighbors Using Maps" section on page 6-84. If the access point has an IP address, a Run Ping Test link is also visible at the bottom of the mesh access point dialog box.

Figure 6-33 Mesh AP Details Page



Step 5 In the Access Point Details configuration page, follow these steps to view configuration details for the mesh access point:

a. Click the **General** tab to view the overall configuration of the mesh access point such as the AP name, MAC address, AP Up time, associated controllers (registered and primary) operational status, and software version.

Note The software version for mesh access points is appended with the letter *m* and the word *mesh* appears in parentheses.

b. Click the **Interface** tab to view configuration details for the interfaces supported on the mesh access point. Interface options are radio and Ethernet.

c. Click the **Mesh Links** tab to view parent and neighbor details (name, MAC address, packet error rate, and link details) for the mesh access point. You can also initiate link tests from this page.

d. Click the **Mesh Statistics** tab to view details on the bridging, queue, and security statistics for the mesh access point. For more details on mesh statistics, see the "Mesh Statistics Tab" section on page 5-83.

Monitoring Mesh Access Point Neighbors Using Maps

To view details on neighbors of a mesh access point from a mesh network map, follow these steps:

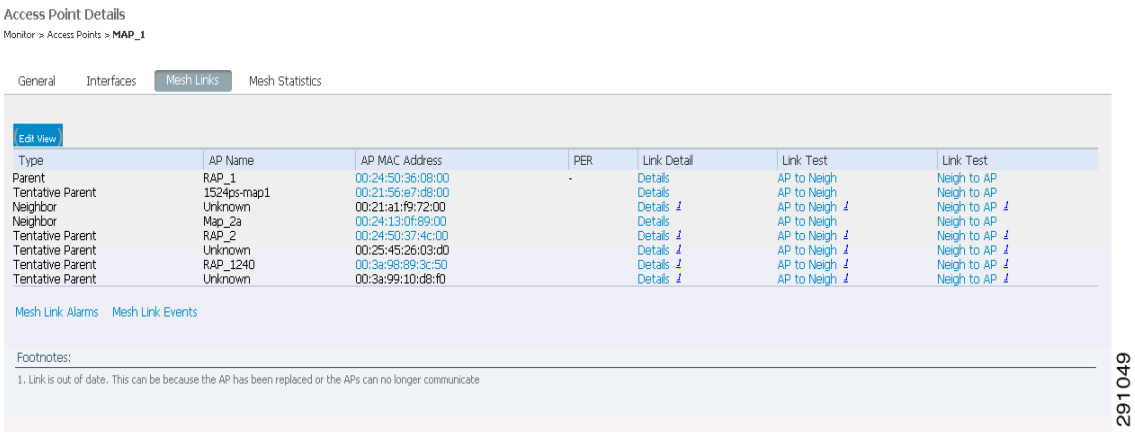
Step 1 Choose **Monitor > Site Maps**.

Step 2 Click the map name that corresponds to the outdoor area, campus, building, or floor you want to monitor.

Step 3 To view detailed information on mesh links for a mesh access point, click the arrow portion of the access point label. The Access Points page appears.

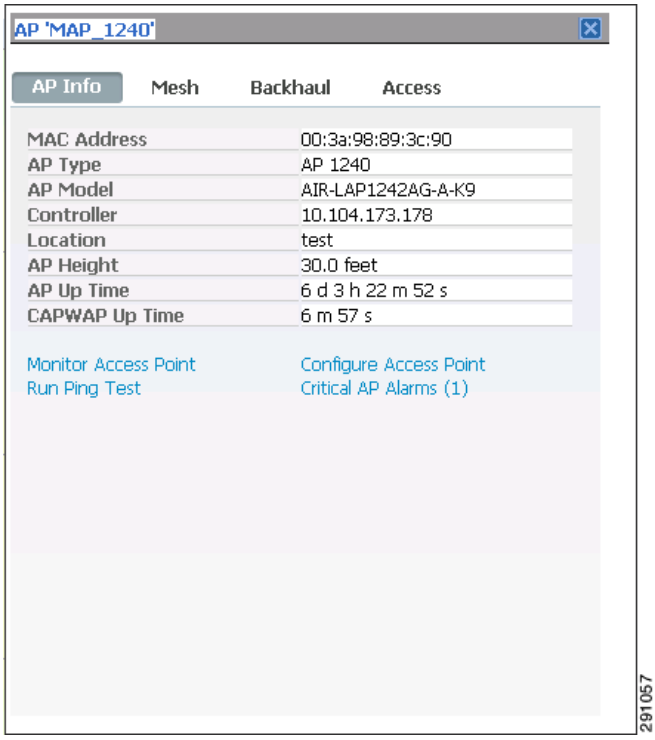
Step 4 Click the **Mesh Links** tab (see Figure 6-34).

Figure 6-34 Access Points > Mesh Links Page



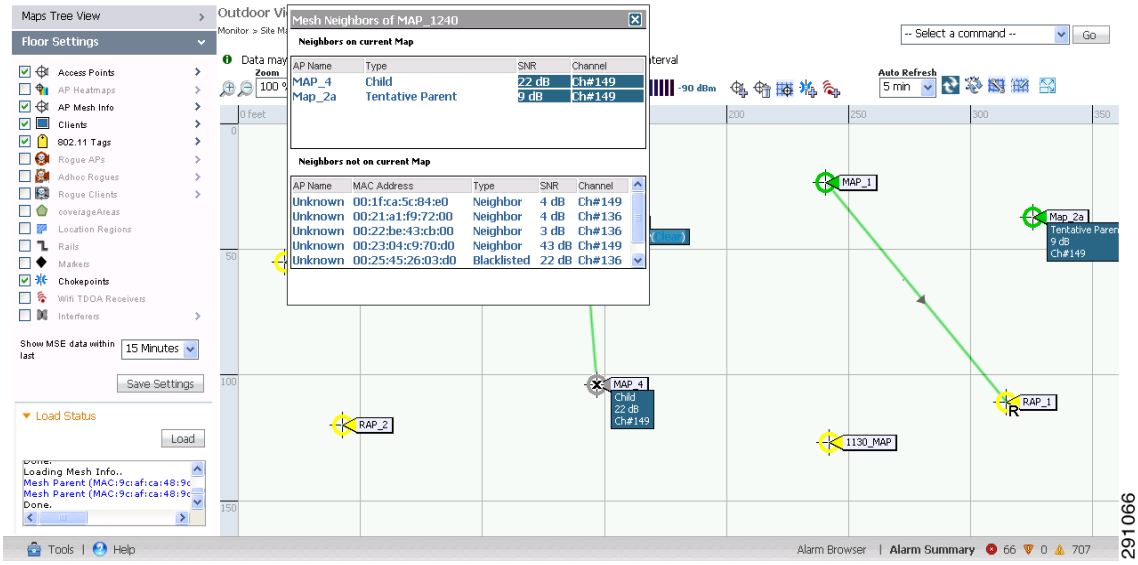
Note You can also view mesh link details for neighbors of a selected access point by clicking the **View Mesh Neighbors** link on the Mesh tab of the access point configuration summary dialog box, which appears when you hover your mouse cursor over an access point on a map (see Figure 6-35).

Figure 6-35 Access Point Configuration Summary Dialog Box



Note Signal-to-noise (SNR) appears in the View Mesh Neighbors dialog box (see Figure 6-36).

Figure 6-36 View Mesh Neighbors Dialog Box



Note In addition to listing the current and past neighbors in the dialog box that appears, labels are added to the mesh access points map icons to identify the selected access point, the neighbor access point, and the child access point. Click the **clear** link of the selected access point to remove the relationship labels from the map.

Note The drop-down lists at the top of the mesh neighbors page indicate the resolution of the map (100%) displayed and how often the information displayed is updated (every 5 mins). You can modify these default values.

Viewing the Mesh Network Hierarchy

You can view the parent-child relationship of mesh access points within a mesh network in an easily navigable display. You can also filter which access points are displayed in the map view by selecting only access points of interest.

To view the mesh network hierarchy for a selected network, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

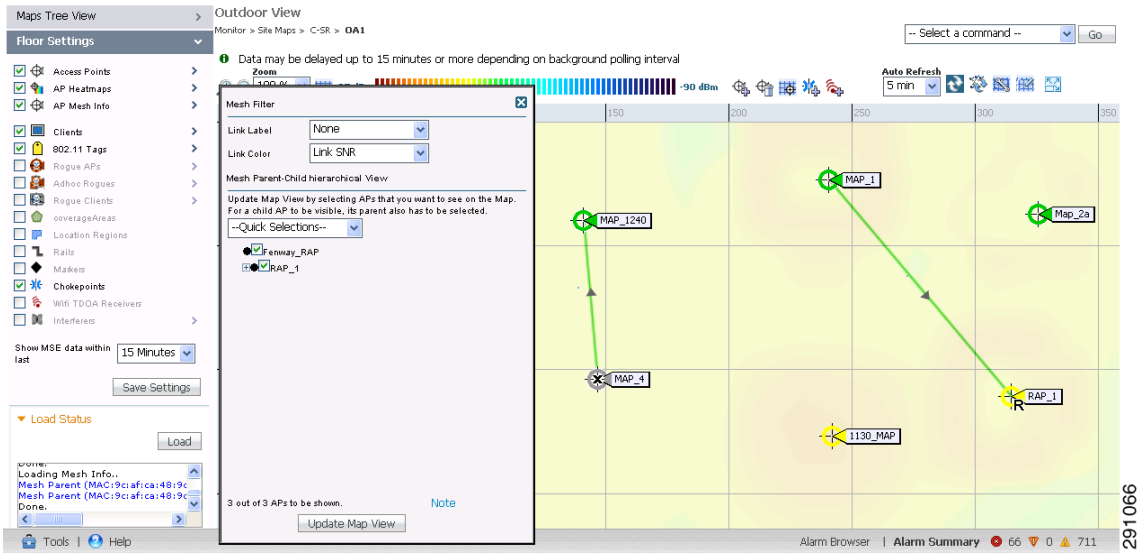
Step 2 Click the map name you want to display.

Step 3 Select the **AP Mesh Info** check box in the left sidebar menu if it is not already selected.

Note The AP Mesh Info check box is only selectable if mesh access points are present on the map. It must be selected to view the mesh hierarchy.

Step 4 Click the blue arrow to the right of the AP Mesh Info to display the Mesh Parent-Child Hierarchical View(see Figure 6-37).

Figure 6-37 Mesh Parent-Child Hierarchical View



Step 5 Click the **plus (+)** sign next to a mesh access point to display its children.

All subordinate mesh access points are displayed when a negative (-) sign appears next to the parent mesh access point entry. For example, in Figure 6-37, the access point, *indoor-mesh-45-rap2*, has only one child, *indoor-mesh-44-map2*.

Step 6 Hover your mouse cursor over the colored dot next to each mesh access point child to view details on the link between it and its parent. Table 6-10 summarizes the parameters that appear.

The color of the dot also provides a quick reference point of the SNR strength:

- A green dot represents a high SNR (above 25 dB).
- An amber dot represents an acceptable SNR (20-25 dB).
- A red dot represents a low SNR (below 20 dB).
- A black dot indicates a root access point.

Table 6-10 Bridging Link Information

Field	Description
Information fetched on	Date and time that information was compiled.
Link SNR	Link signal-to-noise ratio (SNR).
Link Type	Hierarchical link relationship.
SNR Up	Signal-to-noise radio for the uplink (dB).
SNR Down	Signal-to-noise radio for the downlink (dB).
PER	The packet error rate for the link.
Tx Parent Packets	The TX packets to a node while acting as a parent.
Rx Parent Packets	The RX packets to a node while acting as a parent.
Time of Last Hello	Date and time of last hello.

Using Mesh Filters to Modify Map Display of Maps and Mesh Links

In the mesh hierarchical page, you can also define mesh filters to determine which mesh access points display on the map based on hop values as well as what labels display for mesh links.

Mesh access points are filtered by the number of hops between them and their root access point.

To use mesh filtering, follow these steps:

Step 1 To modify what label and color displays for a mesh link, follow these steps:

a. In the Mesh Parent-Child Hierarchical View, choose an option from the Link Label drop-down list. Options are None, Link SNR, and Packet Error Rate.

b. In the Mesh Parent-Child Hierarchical View, choose an option from the Link Color drop-down list to define which parameter (Link SNR or Packet Error Rate) determines the color of the mesh link on the map.

Note The color of the link provides a quick reference point of the SNR strength or Packet Error Rate. Table 6-11 defines the different link colors.

Table 6-11 Definition for SNR and Packet Error Rate Link Color

Link Color	Link SNR	Packet Error Rate (PER)
Green	Represents a SNR above 25 dB (high value)	Represents a PER of one percent (1%) or lower
Amber	Represents a SNR between 20 and 25 dB (acceptable value)	Represents a PER that is less than ten percent (10%) and greater than one percent (1%)
Red	Represents a SNR below 20 dB (low value)	Represents a PER that is greater than ten percent (10%)

Note The Link label and color settings are reflected on the map immediately (see Figure 6-38). You can display both SNR and PER values simultaneously.

Step 2 To modify which mesh access points display based on the number of hops between them and their parents, do the following:

a. In the Mesh Parent-Child Hierarchical View, choose the appropriate options from the Quick Selections drop-down list. A description of the options is provided in Table 6-12.

Table 6-12 Quick Selection Options

Field	Description
Select only Root APs	Choose this setting if you want the map view to display root access points only.
Select up to 1st hops	Choose this setting if you want the map view to display 1st hops only.
Select up to 2nd hops	Choose this setting if you want the map view to display 2nd hops only.
Select up to 3rd hops	Choose this setting if you want the map view to display 3rd hops only.
Select up to 4th hops	Choose this setting if you want the map view to display 4th hops only.
Select All	Select this setting if you want the map view to display all access points.

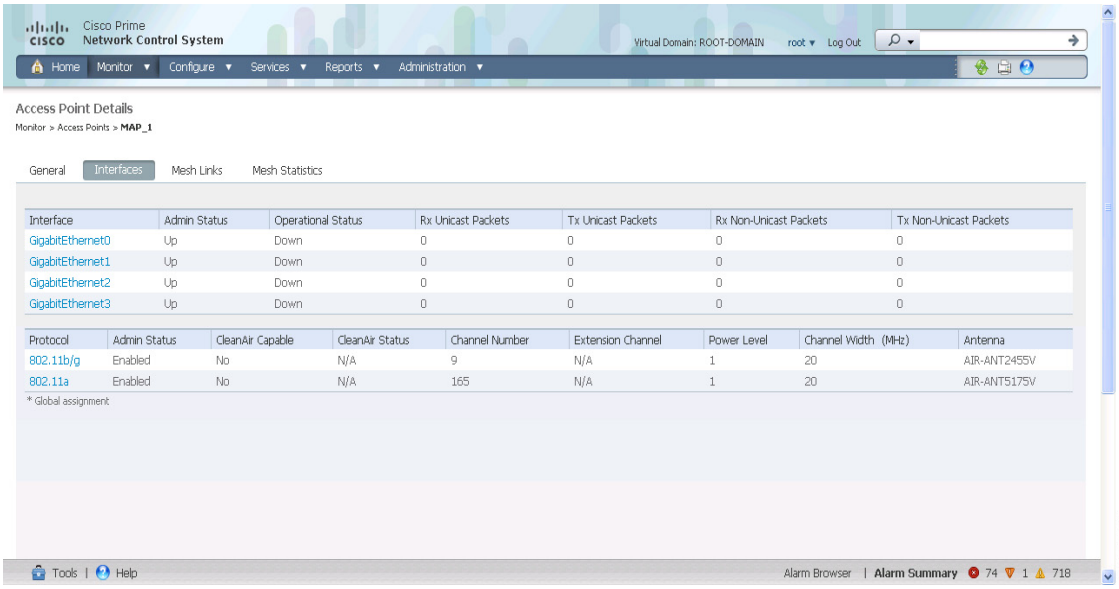
b. Click **Update Map View** to refresh the screen and display the map view with the selected options.

Note Map view information is retrieved from the NCS database and is updated every 15 minutes.

Note You can also select or unselect the check boxes of access points in the mesh hierarchical view to modify which mesh access points are displayed. For a child access point to be visible, the parent access point to root access point must be selected.

Note If you want to have the MAC address appear with the client logo in the Monitor > Site Maps page, follow these steps:
a) Go to the Maps Tree View.
b) Click the > beside Clients.
c) Unselect the **Small Icons** check box.

Figure 6-38 Mesh Filter and Hop Count Configuration Page



Monitoring Tags Using Maps

On an NCS map, you can review the name of the access point that generated the signal for a tagged asset, its strength of signal and when the location information was last updated for the asset. This information is displayed by simply hovering the mouse cursor over the asset tag icon on the map.

To enable tag location status on a map, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Choose **Campus > Building > Floor** for the applicable mobility services engine and tag.

Step 3 Select the **802.11 Tags** check box in the Floor Settings pane (left), if not already selected.

Note Do not click **Save Settings** unless you want to save changes made to the Floor Settings across all maps.

Step 4 Hover the mouse cursor over a tag icon (yellow tag) and a summary of its configuration appears in a dialog box.

Step 5 Click the **tag** icon to see tag details in a new window.

Using Planning Mode

You can calculate the recommended number and location of access points based on whether data and/or voice traffic and/or location are active.

Note Based on the throughput specified for each protocol (802.11a or 802.11 b/g), planning mode calculates the total number of access points required that would provide optimum coverage in your network.

Accessing Planning Mode

To access the Planning Mode feature, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

Step 2 Select the desired campus or building from the Name list.

Step 3 Click the desired floor area in the Building.

Step 4 From the Select a command drop-down list, choose **Planning Mode**.

Step 5 Click **Go**.

Note Planning mode does not use AP type or Antenna pattern information for calculating the number of access points required. The calculation is based on the access point coverage area or the number of users per access point.

Planning Mode options:

- Add APs—Enables you to add access points on a map. See the "Using Planning Mode to Calculate Access Point Requirements" section on page 6-92 for details.
- Delete APs—Deletes the selected access points.
- Map Editor—Opens the Map Editor window. See the "Using the Map Editor" section on page 6-71 for more details.
- Synchronize with Deployment—Synchronizes your planning mode access points with the current deployment scenario.
- Generate Proposal—View a planning summary of the current access points deployment.
- Planned AP Association Tool—Allows you to perform add, delete or import an AP Association from an excel or CSV file. Once an access point is defined, it can be associated to a base radio MAC address using the Planned AP Association Tool. If the AP is not discovered they get pushed into a standby bucket and get associated when discovered.

Note AP association is subjected to a limitation that AP should not belong to any floor or outdoor area. If the AP is already assigned to a floor or outdoor area, then the standby bucket holds the AP and when removed from the floor or outdoor, get positioned to the given floor. One Mac address cannot be put into bucket for multiple floor or outdoor areas.

Note The map synchronizations works only if the AP is associated to a base radio MAC address and not to its Ethernet MAC address.

Using Planning Mode to Calculate Access Point Requirements

The NCS planning mode enables you to calculate the number of access points required to cover an area by placing fictitious access points on a map and allowing you to view the coverage area. Based on the throughput specified for each protocol (802.11a/n or 802.11b/g/n), planning mode calculates the total number of access points required to provide optimum coverage in your network. You can calculate the recommended number and location of access points based on the following criteria:

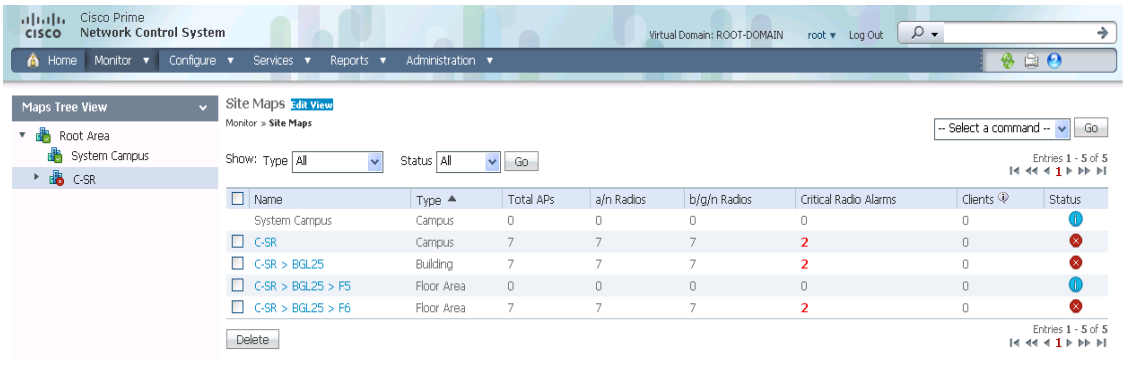
- traffic type active on the network: data or voice traffic or both
- location accuracy requirements
- number of active users
- number of users per square footage

To calculate the recommended number and placement of access points for a given deployment, follow these steps:

Step 1 Choose **Monitor > Site Maps**.

The Site Map page appears (see Figure 6-39).

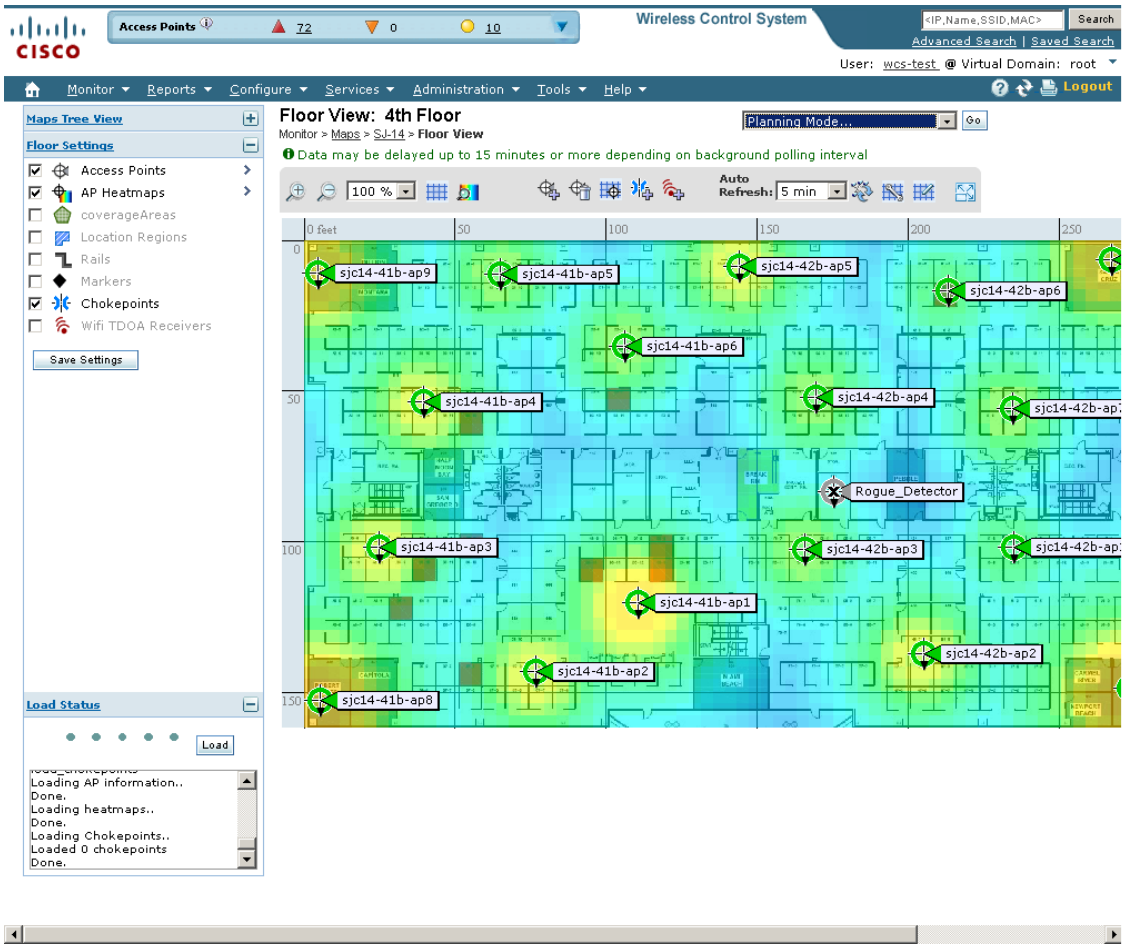
Figure 6-39 Monitor > Site Maps Page



Step 2 Select the appropriate location link from the list that appears.

A color-coded map appears showing placement of all installed elements (access points, clients, tags) and their relative signal strength (see Figure 6-40).

Figure 6-40 Selected Floor Area Showing Current Access Point Assignments



Step 3 Choose **Planning Mode** from the Select a command drop-down list (top-right), and click **Go**. A blank floor map appears.

Step 4 Click **Add APs**.

Step 5 In the page that appears, drag the dashed-line rectangle over the map location for which you want to calculate the recommended access points (see Figure 6-41).

Note Adjust the size or placement of the rectangle by selecting the edge of the rectangle and holding down the **Ctrl** key. Move the mouse as necessary to outline the targeted location.

Figure 6-41 Add APs page

Step 6 Choose **Automatic** from the Add APs drop-down list.

Step 7 Choose the **AP Type** and the appropriate antenna and protocol for that access point.

Step 8 Choose the target throughput for the access point.

Step 9 Select the check box(es) next to the **service(s)** that is used on the floor. Options are Data/Coverage (default), Voice, Location, and Location with Monitor Mode APs. (see Table 6-13).

Note You must select at least one service or an error occurs.

Note If you select the **Advanced Options** check box, two additional access point planning options appear: Demand and Override Coverage per AP. Additionally, a Safety Margin field appears for the Data/Coverage and Voice safety margin options.

Table 6-13 Definition of Services Option

Service Options	Description			
Data/Coverage	Select this check box if data traffic is transmitted on the wireless LAN. The following densities are used depending on the band and data rates:			
	Band	**Path Loss Model (dBm)**	**Date Rate (Mb/s)**	**Area (Sq. ft.)**
	802.11a	–3.3	10-12	6000
	802.11a	–3.3	15-18	4500

Table 6-13 Definition of Services Option (continued)

Service Options	Description			
	802.11a	–3.5	10-12	5000
	802.11a	–3.5	15-18	3250
	802.11bg	–3.3	5	6500
	802.11bg	–3.3	6	4500
	802.11bg	–3.5	5	5500
	802.11bg	–3.5	6	3500
	If you select the **Advanced Options** check box, you can select the desired safety margin (aggressive, safe, or very safe) of the signal strength threshold for data. • Aggressive = Minimum (–3 dBm) • Safe = Medium (0 dBm) • Very Safe = Maximum (+3 dBm)			
Voice	Select the Voice check box, if voice traffic is transmitted on the wireless LAN. If you select the **Advanced Options** check box, you can select the desired safety margin (aggressive, safe, very safe or 7920-enabled) of the signal strength threshold for voice. • Aggressive = Minimum [–78 dBm (802.11a/b/g)] • Safe = Medium [–75 dBm (802.11a/b/g)] • Very Safe = Maximum [(–72 dBm (802.11a/b/g)] • 7920_enabled = [(–72 dBm (802.11a); –67 dBm (802.11b/g)]			
Location	Select this check box to ensure that the recommended access point calculation provides the true location of an element within 10 meters at least 90% of the time. To meet the criteria, access points are collocated within 70 feet of each other in a hexagonal pattern employing staggered and perimeter placement. **Note** Each service option includes all services that are listed above it. For example, if you select the Location check box, the calculation considers data/coverage, voice, and location in determining the optimum number of access points required.			

Table 6-14 Definition of Advanced Services

Service Options	Description			
Data/Coverage	Select this check box, if data traffic is transmitted on the wireless LAN. The following densities are used depending on the band and data rates:			
	Band	**Path Loss Model (dBm)**	**Date Rate (Mb/s)**	**Area (Sq. ft.)**

Table 6-14 Definition of Advanced Services (continued)

Service Options	Description			
	802.11a	–3.3	10-12	6000
	802.11a	–3.3	15-18	4500
	802.11a	–3.5	10-12	5000
	802.11a	–3.5	15-18	3250
	802.11bg	–3.3	5	6500
	802.11bg	–3.3	6	4500
	802.11bg	–3.5	5	5500
	802.11bg	–3.5	6	3500
	If you select the **Advanced Options** check box, you can select the desired safety margin (aggressive, safe, or very safe) of the signal strength threshold for data. • Aggressive = Minimum (–3 dBm) • Safe = Medium (0 dBm) • Very Safe = Maximum (+3 dBm)			
Voice	Select the voice check box, if voice traffic is transmitted on the wireless LAN. If you select the **Advanced Options** check box, you can select the desired safety margin (aggressive, safe, very safe or 7920-enabled) of the signal strength threshold for voice. • Aggressive = Minimum [–78 dBm (802.11a/b/g)] • Safe = Medium [–75 dBm (802.11a/b/g)] • Very Safe = Maximum [(–72 dBm (802.11a/b/g)] 7920_enabled = [(–72 dBm (802.11a); –67 dBm (802.11b/g)]			
Location	Select this check box to ensure that the recommended access point calculation provides the true location of an element within 10 meters at least 90% of the time. To meet the criteria, access points are collocated within 70 feet of each other in a hexagonal pattern employing staggered and perimeter placement. **Note** Each service option includes all services that are listed above it. For example, if you select the Location check box, the calculation considers data/coverage, voice, and location in determining the optimum number of access points required.			
Demand	Select this check box, if you want to use the total number of users or user ratio per access point as a basis for the access point calculation.			

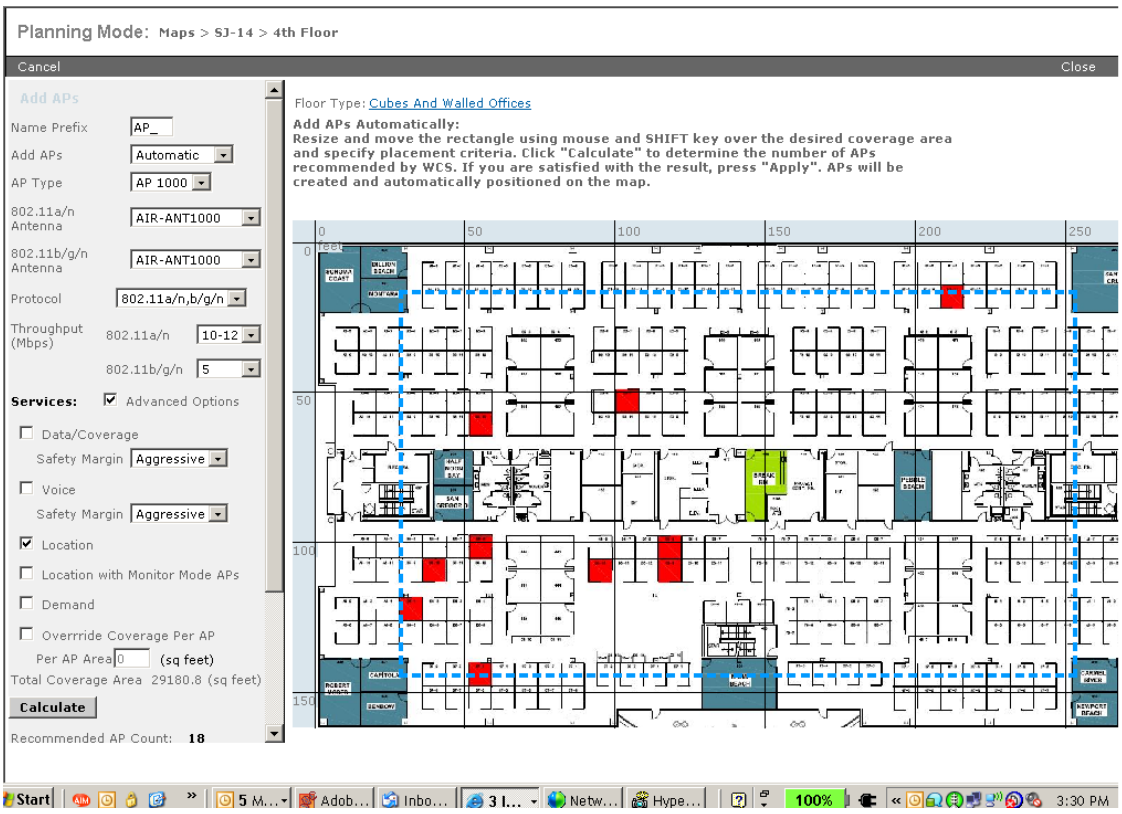
Table 6-14 Definition of Advanced Services (continued)

Service Options	Description
Override Coverage per AP	Select this check box, if you want to specify square foot coverage as the basis for access point coverage.
Safety Margin	Select this check box to qualify relative signal strength requirements for data and voice service in the access point calculation. Options are: Aggressive, Safe, Very Safe, and 7920-enabled (voice only). Select **Aggressive** to require minimal signal strength requirements in the calculation and **Very Safe** to request the highest signal strength.

Step 10 Click **Calculate**.

The recommended number of access points given the selected services appears (see Figure 6-42).

Figure 6-42 Recommended Number of Access Points Given Selected Services and Fields

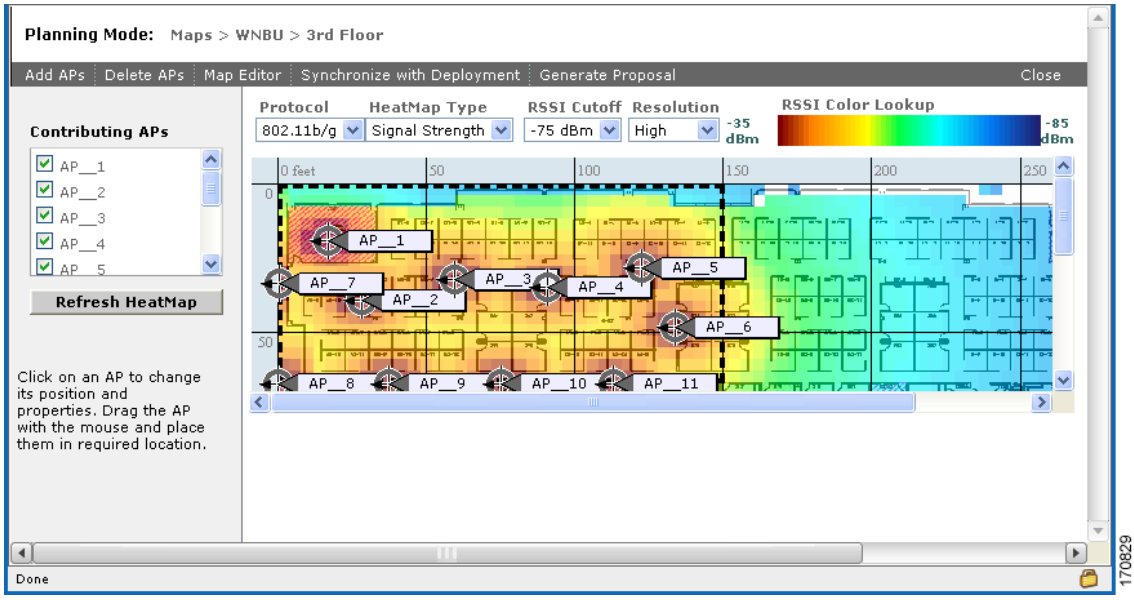


Note Recommended calculations assume the need for consistently strong signals unless adjusted downward by the **safety margin** advanced option. In some cases, the recommended number of access points is higher than what is required.

Note Walls are not used or accounted for in planning mode calculations.

Step 11 Click **Apply** to generate a map that shows proposed deployment of the recommended access points in the selected area based on the selected services and parameters (see Figure 6-43).

Figure 6-43 Recommended Access Point Deployment Given Selected Services and Fields



Step 12 Choose **Generate Proposal** to display a textual and graphical report of the recommended access point number and deployment based on the given input.

Refresh Options

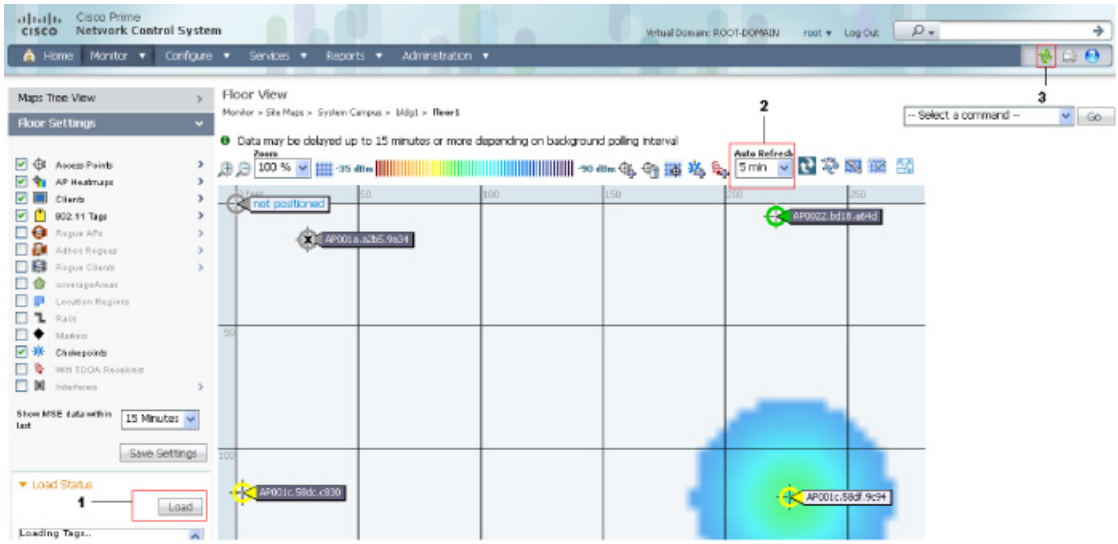
To prepare for monitoring your wireless LANs, become familiar with the various refresh options for a map.

- Load—The Load option in the left sidebar menu refreshes map data from the NCS database on demand (see callout 1 in Figure 6-44).
- Auto Refresh—The Auto Refresh option (see callout 2 in Figure 6-44) provides an interval drop-down list to set how often to refresh the map data from the database.
- Refresh from network—By clicking the **Refresh from network** icon to the right of the Auto Refresh drop-down list (see callout 2 in Figure 6-44), you can refresh the map status and statistics directly from the controller through an SNMP fetch rather than polled data from the NCS database that is five to fifteen minutes older.

Note If you have monitor mode access points on the floor plan, you have a choice between IDS or coverage heatmap types. A coverage heatmap excludes monitor mode access points, and an IDS heatmap includes them.

- Refresh browser—Above the map next to the Logout and Print option is another refresh option (see callout 3 in Figure 6-44). Clicking this refreshes the complete page, or the map and its status and statistics if you are on a map page.

Figure 6-44 Refresh Options



Creating a Network Design

After access points have been installed and have joined a controller, and the NCS has been configured to manage the controllers, set up a network design. A *network design* is a representation within the NCS of the physical placement of access points throughout facilities. A hierarchy of a single campus, the buildings that comprise that campus, and the floors of each building constitute a single network design. These steps assume that the location appliance is set to poll the controllers in that network, as well as be configured to synchronize with that specific network design, to track devices in that environment. The concept and steps to perform synchronization between the NCS and the mobility service engine are explained in the *Cisco 3350 Mobility Services Engine Configuration Guide*.

Designing a Network

To design a network, follow these steps:

Step 1 Open the NCS web interface and log in.

Note To create or edit a network design, you must log into the NCS and have SuperUser, Admin, or ConfigManager access privileges.

Step 2 Choose **Monitor > Site Maps**.

Step 3 From the drop-down list on the right-hand side, choose either New Campus or New Building, depending on the size of the network design and the organization of maps. If you chose New Campus, continue to Step 4. To create a building without a campus, skip to Step 14.

Step 4 Click **Go**.

Step 5 Enter a name for the campus network design, a contact name, and the file path to the campus image file. .bmps and .jpgs are importable.

Note You can use the Browse... button to navigate to the location.

Step 6 Click **Next**.

Step 7 Select the **Maintain Aspect Ratio** check box. Enabling this check box causes the horizontal span of the campus to be 5000 feet and adjusts the vertical span according to the aspect ratio of the image file. Adjusting either the horizontal or vertical span changes the other field in accordance with the image ratio.

You should unselect the Maintain Aspect Ratio check box if you want to override this automatic adjustment. You could then adjust both span values to match the real world campus dimensions.

Step 8 Click **OK**.

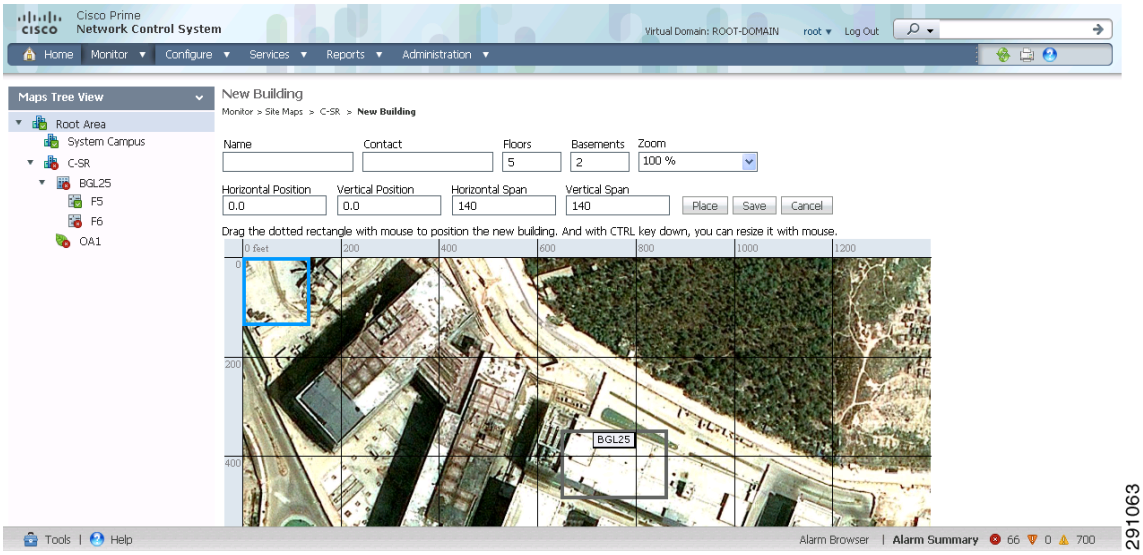
Step 9 In the Monitor > Site Maps page, click the hyperlink associated with the above-made campus map. A page showing the new campus image is displayed.

Step 10 From the Select a command menu on the upper right of the page, choose **New Building**, and click **Go**.

Step 11 Enter the name of the building, the contact person, the number of floors and basements in the building, and the dimensions. Click **OK**.

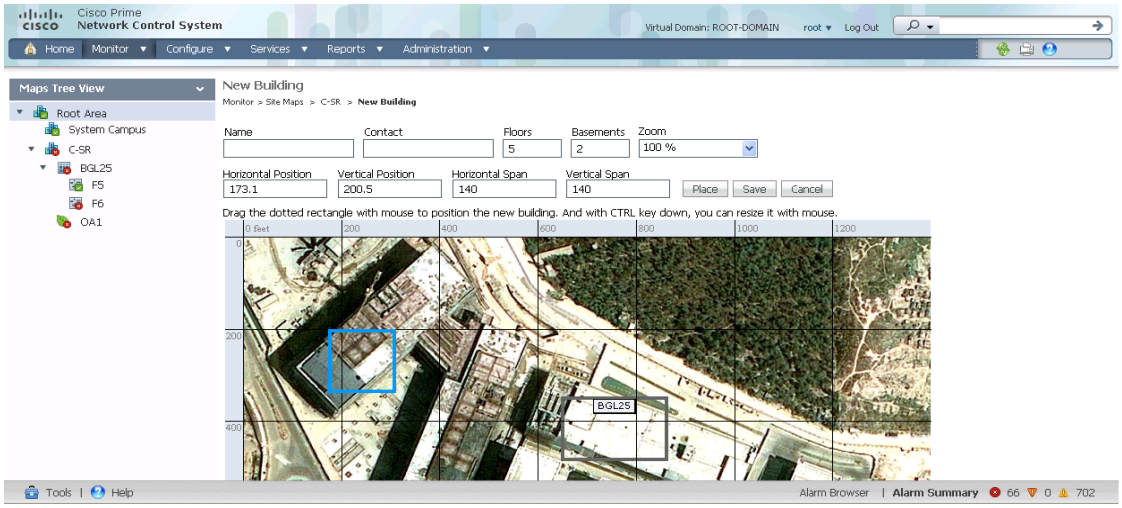
Step 12 Indicate which building on the campus map is the correct building by clicking the blue box in the upper left of the campus image and dragging it to the intended location (see Figure 6-45). To resize the blue box, hold down the **Ctrl** key and click and drag to adjust its horizontal size. You can also enter dimensions of the building by entering numerical values in the Horizontal Span and Vertical Span fields and click **Place**. After resizing, reposition the blue box if necessary by clicking it and dragging it to the desired location. Click **Save**.

Figure 6-45 Repositioning Building Highlighted in Blue



Step 13 The NCS is then returned to the campus image with the newly created building highlighted in a green box. Click the **green box** (see Figure 6-46).

Figure 6-46 Newly Created Building Highlighted in Blue



Step 14 To create a building without a campus, choose **New Building** and click **Go**.

Step 15 Enter the name, contact information, number of floors and basements, and dimension information of the building. Click **Save**. The NCS is returned to the Monitor > Site Maps page.

Step 16 Click the hyperlink associated with the newly created building.

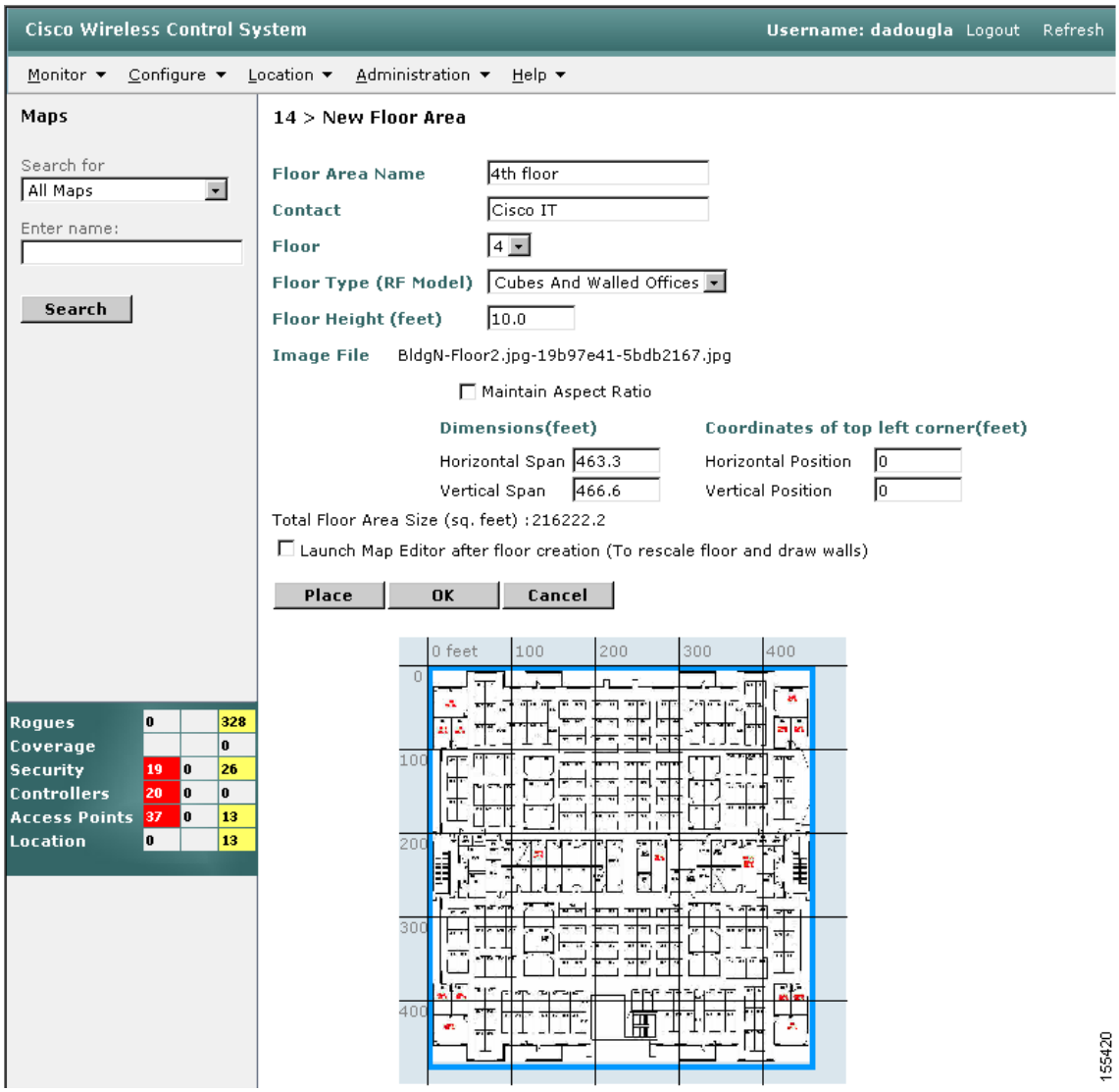
Step 17 In the Monitor > Site Maps > *Campus Name* > *Building Name* page, from the drop-down list and choose **New Floor Area**. Click **Go**.

Step 18 Enter a name for the floor, a contact, a floor number, floor type, and height at which the access points are installed and the path of the floor image. Click **Next**.

Note The Floor Type (RF Model) field specifies the type of environment on that specific floor. This RF Model indicates the amount of RF signal attenuation likely to be present on that floor. If the available models do not properly characterize a floor's makeup, details on how to create RF models specific to a floor's attenuation characteristics are available in the *Cisco 3350 Mobility Services Engine Configuration Guide*.

Step 19 If the floor area is a different dimension than the building, adjust floor dimensions by either making numerical changes to the text fields under the Dimensions heading or by holding the **Ctrl** key and clicking and dragging the blue box around the floor image. If the floor's location is offset from the upper left corner of the building, change the placement of the floor within the building by either clicking and dragging the blue box to the desired location or by altering the numerical values under the **Coordinates of top left corner** heading (see Figure 6-47). After making changes to any numerical values, click Place.

Figure 6-47 Repositioning Using Numerical Value Fields



Step 20 Adjust the characteristics of the floor with the NCS map editor by selecting the check box next to **Launch Map Editor**. For an explanation of the map editor feature, see the "Using the Map Editor" section on page 6-71.

Step 21 At the image of the new floor (Monitor > Site Maps > *CampusName* > *BuildingName* > *FloorName*), go to the drop-down list on the upper right and choose **Add Access Points**. Click **Go**.

Step 22 All access points that are connected to controllers are displayed. Even controllers that the NCS is configured to manage but which have not yet been added to another floor map are displayed. Select the access points to be placed on the specific floor map by checking the boxes to the left of the access point entries. Select the box to the left of the Name column to select all access points. Click **OK**.

Step 23 Each access point you have chosen to add to the floor map is represented by a gray circle (differentiated by access point name or MAC address) and is lined up in the upper left part of the floor map. Drag each access point to the appropriate location. (Access points turn blue when you click them to relocate them.) The small black arrow at the side of each access point represents Side A of each access point, and each arrow of the access point must correspond with the direction in which the access points were installed. (Side A is clearly noted on each 1000 series access point and has no relevance to the 802.11a/n radio.)

Step 24 To adjust the directional arrow, choose the appropriate orientation on the Antenna Angle drop-down list. Click **Save** when you are finished placing and adjusting each direction of the access point.

Note Access point placement and direction must directly reflect the actual access point deployment or the system cannot pinpoint the device location.

Step 25 Repeat these steps to create campuses, buildings, and floors until each device location is properly detailed in a network design.

Importing or Exporting WLSE Map Data

When you convert an access point from autonomous to CAPWAP and from the WLSE to the NCS, one of the conversion steps is to manually re-enter the access point information into the NCS. This can be a time-consuming step. To speed up the process, you can export the information about access points from the WLSE and import it into the NCS.

Note The NCS expects a .tar file and checks for a .tar extension before importing the file. If the file you are trying to import is not a .tar file, the NCS displays an error message and prompts you to import a different file.

To map properties and import a tar file containing WLSE data using the NCS web interface, follow these steps. For more information on the WLSE data export functionality (WLSE version 2.15), see http://<WLSE_IP_ADDRESS>:1741/debug/export/exportSite.jsp.

Step 1 Choose **Monitor > Site Maps**.

Step 2 Choose **Properties** from the Select a command drop-down list, and click **Go**.

Step 3 In the Export/Import AP/LS/SP Placement, click **Browse** to select the file to import.

Step 4 Find and select the .tar file to import and click **Open**.

The NCS displays the name of the file in the Import From field.

Step 5 Click **Import**.

The NCS uploads the file and temporarily saves it into a local directory while it is being processed. If the file contains data that cannot be processed, the NCS prompts you to correct the problem and retry. After the file has been loaded, the NCS displays a report of what is added to the NCS. The report also specifies what cannot be added and why.

If some of the data to be imported already exists, the NCS either uses the existing data in the case of campuses or overwrites the existing data using the imported data in the cases of buildings and floors.

If there are duplicate names between a WLSE site and building combination and an NCS campus (or top-level building) and building combination, the NCS displays a message in the Pre Execute Import Report indicating that it will delete the existing building.

Step 6 Click **Import** to import the WLSE data.

NCS displays a report indicating what was imported.

Note Because a WLSE file has no floor number information, the structure of the floor index calculation after WLSE is imported into the NCS is in descending order. You can click the floor image to go directly to the appropriate floor page.

Step 7 Choose **Monitor > Site Maps** to verify the imported data.

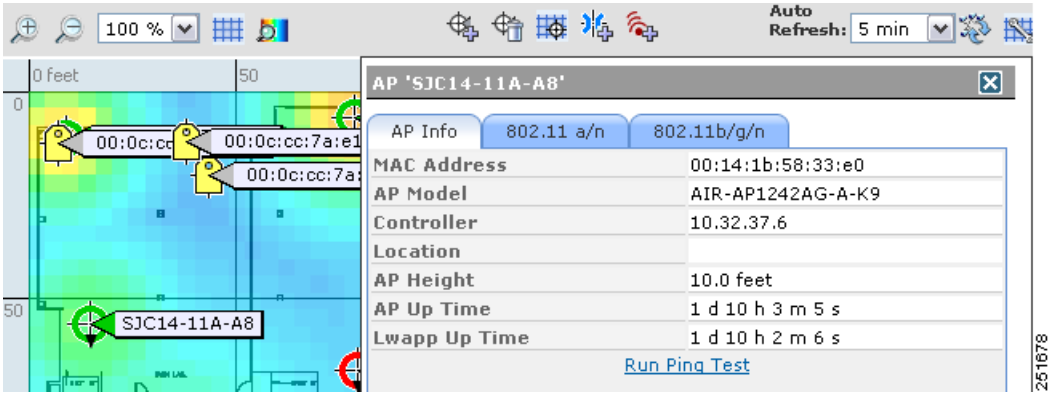
Monitoring Device Details

Access Point Details

Hover your mouse cursor over an access point icon to view access point details (Figure 6-48). Click the appropriate tab to view access point and radio information.

Note Monitor mode access points are shown with gray labels to distinguish them from other access points.

Figure 6-48 Access Point Details



The AP Info tab includes the following access point information:

- MAC address
- Access point model
- Controller
- Location
- Access point height
- Access point uptime
- LWAPP uptime

Note From the AP Info tab, you can run a ping test by clicking the **Run Ping Test** link.

The 802.11 tabs (Figure 6-49) includes the following radio information:

- Channel number
- Extension channel
- Channel width
- Transmit power level
- Client count

Note The number of clients associated to access points might not match the total number of clients.

- Receiving and transmitting utilization percentages
- Channel utilization percentage

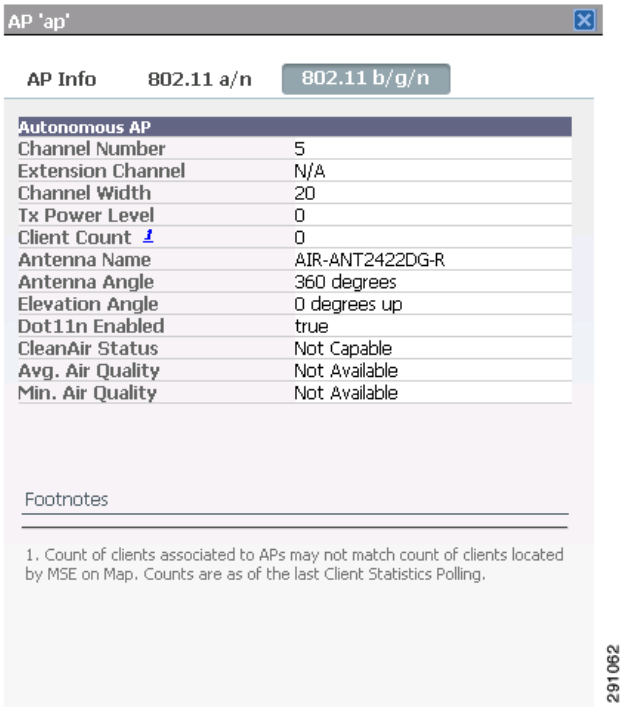
Note Total utilization = (Rx + Tx + Channel utilization) scaled to 100%.

- Antenna name and angle
- Elevation angle

Note From either of the 802.11 tabs, you can view Rx neighbors and radio details for this access point by clicking the appropriate link (**View Rx Neighbors** or **View Radio Details**).

- Dot11n Enabled
- CleanAir Status—Displays the CleanAir status of the access point, whether or not CleanAir is enabled on the access point.
- Average Air Quality—Displays the average air quality on this access point.
- Minimum Air Quality—Displays the minimum air quality on this access point.

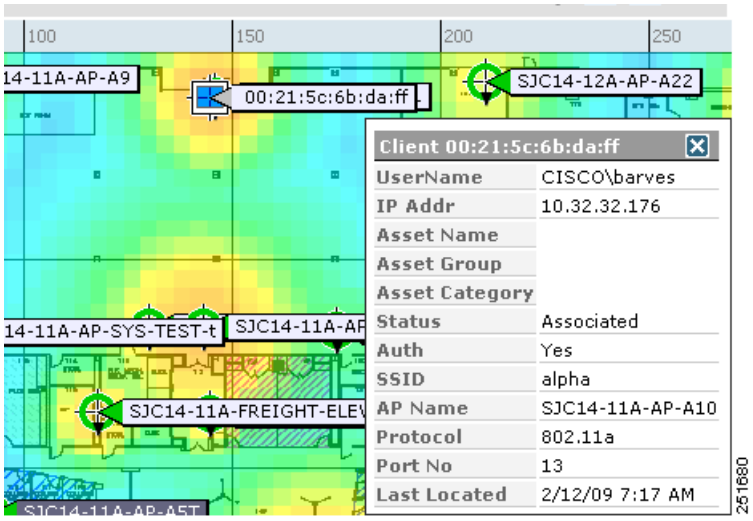
Figure 6-49 802.11 Tabs



Client Details

Hover your mouse cursor over a client icon to view client details (Figure 6-50).

Figure 6-50 Client Details



Client details information includes the following:

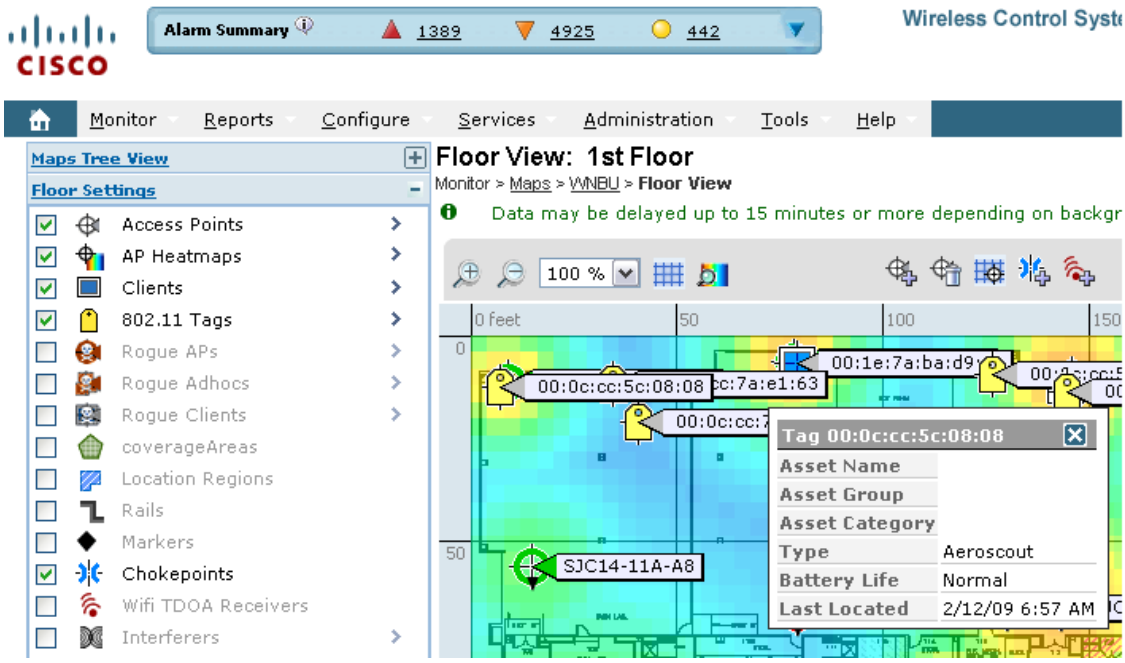
- Username
- IP address

- Asset name, group, and category
- Status
- Auth
- SSID
- Access point name
- Protocol
- Port number
- Last location

Tag Details

Hover your mouse cursor over a tag icon to view tag details (Figure 6-51).

Figure 6-51 Tag Details



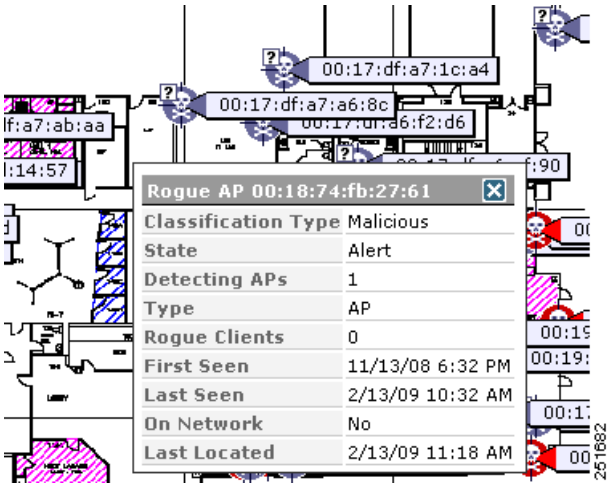
Tag details includes the following:

- Asset name, group, and category
- Type
- Battery life
- Last located

Rogue Access Point Details

Hover your mouse cursor over an access point icon to view rogue access point details (Figure 6-52).

Figure 6-52 Rogue Access Point Details



Rogue access point details includes the following:

- Classification type—Friendly, malicious, or unknown.
- State
- Detecting access points
- Type
- Rogue clients
- First seen
- Last seen
- On network
- Last located

Rogue Adhoc Details

Hover your mouse cursor over an access point icon to view rogue ad hoc details.

Rogue Client Details

Hover your mouse cursor over an access point icon to view rogue client details (Figure 6-53).

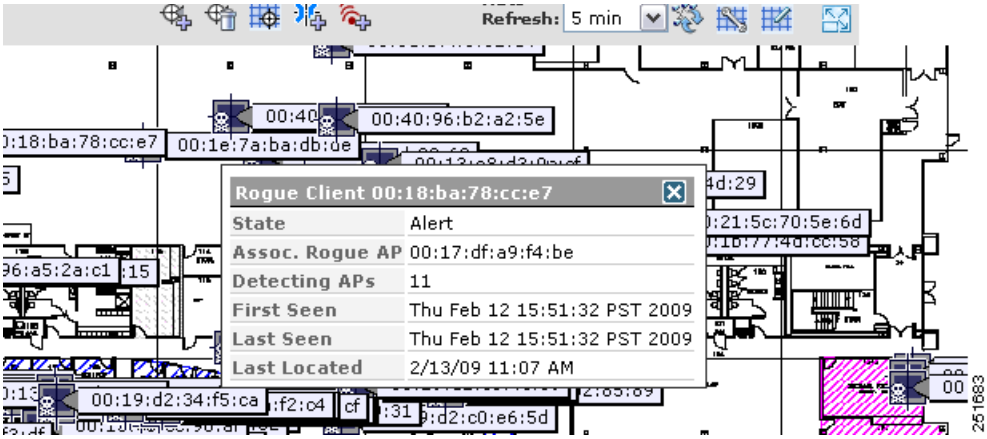
Interferer Details

Hover your mouse cursor over an interferer icon to view its details. Interferer details includes the following:

- Interferer Name—The name of the interfering device.
- Affected Channels—The channel the interfering device is affecting.

- Detected Time—The time at which the interference was detected.
- Severity—The severity index of the interfering device.
- Duty Cycle—The duty cycle (in percentage) of the interfering device.
- RSSI (dBm)—The Received Signal Strength Indicator of the interfering device.

Figure 6-53 Rogue Client Details



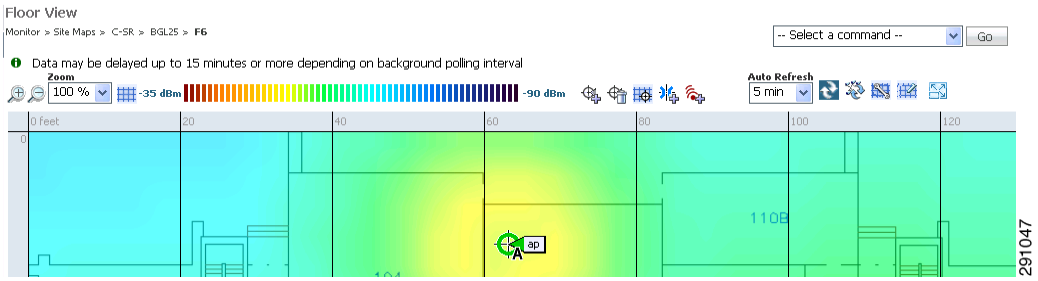
Rogue client details includes the following:

- State
- Associated rogue access point
- Detecting access points
- First seen
- Last seen
- Last located

Floor View Navigation

The main Floor View navigation pane (Figure 6-54) provides access to multiple map functions.

Figure 6-54 Floor View Navigation Pane



This navigation pane includes the following functionality:

- Zoom In/Zoom Out—Click the magnifying glass icon with the plus sign (+) to enlarge the map view. Click the magnifying glass icon with the minus sign (-) to decrease the size of the map view.
- Map Size—Use the map size drop-down list to manually select the map view size (ranging from 50% to 800%).
- Show Grid—Click to show or hide the grid that displays distance in feet on the map.
- RSSI Legend—Hover your mouse cursor over the RSSI Legend icon to display the RSSI color scheme (ranging from red/-35 dBm to dark blue/-90 dBm).
- Add Access Points—Click to open the Add Access Points page. For more information, see the "Adding Access Points to a Floor Area" section on page 6-34.
- Remove Access Points—Click to open the Remove Access Points page. Select the access points that you want to remove and click **OK**. For more information, see "Removing Access Points" section on page 6-39.
- Position Access Points—Click to open the Position Access Points page. For more information, see "Placing Access Points" section on page 6-40.
- Add Chokepoints—Click to open the Add Chokepoints page. For more information, see the *Cisco Context-Aware Services Configuration Guide*.
- Add WiFi TDOA Receivers—Click to open the Add Wi-Fi TDOA Receivers page. For more information, see the *Cisco Context-Aware Services Configuration Guide*.
- Auto Refresh—From the drop-down list, choose the length of time between each system refresh.
- Refresh from Network—Click to initiate an immediate refresh of the current data.
- Planning Mode—Click to open the Planning Mode window. For more information, see the "Using Planning Mode" section on page 6-91 for more information.
- Map Editor—Click to open the Map Editor.

Full Screen—Click to increase the size of the map to full screen. Once there, click **Exit Full Screen** to return to the normal view.

Understanding RF Heatmap Calculation

A radio frequency heat map is a graphical representation of the strength of the RF signals. Because WLANs are very dynamic and nondeterministic in nature, administrators can never be certain of the coverage at a particular moment. To help combat this challenge, the NCS provides a map of your floor plan along with visual cues as to the Wi-Fi coverage of the floor. These maps are called heatmaps because they are similar to the colored maps used to show varying levels of heat in oceanography or geographical sciences. Color is used to show the various levels of signal strength. The different shades in the "heatmap" reflect differing signal strengths.

This color visualization is extremely useful. At one glance, you can see the current state of coverage (without having to walk around measuring it), the signal strength, and any gaps or "holes" in the WLAN. Because floor plans and heat maps are very intuitive, this system greatly enhances the speed and ease with which you support your organization and troubleshoot specific problems.

The RF heatmap calculation is based on an internal grid. Depending on the exact positioning of an obstacle in that grid, the RF heatmap, within a few feet or meters of the obstacle, might or might not account for the obstacle attenuation.

In detail, grid squares partially affected by an obstacle crossing the grid square might or might not incorporate the obstacle attenuation according to the geometry of the access point, obstacle, and grid.

For example, consider a wall crossing one grid square. The midpoint of the grid square is behind the wall from the AP, so the whole grid square is colored with attenuation, including (unfortunately) the top left corner that is actually in front of the wall (see Figure 6-55).

Figure 6-55 Access Point/Grid Example One (Actual Attenuation)

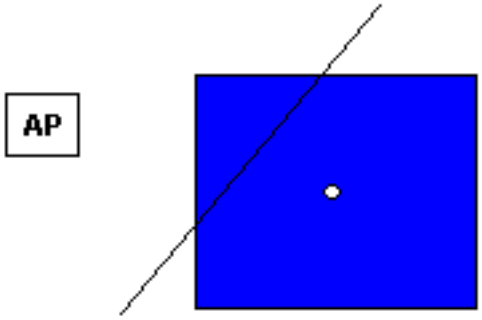
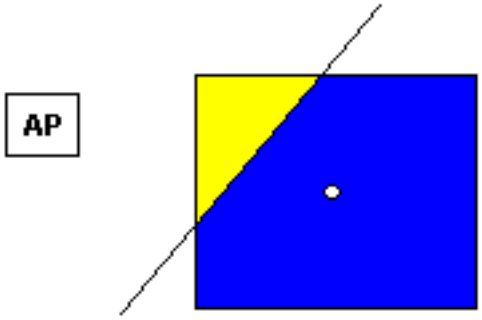


Figure 6-56 displays how the attenuation would ideally appear in this situation.

Figure 6-56 Access Point/Grid Example One (Ideal Attenuation)



The midpoint of the grid square is on the same side of the wall as the AP, so the whole grid square is not colored with attenuation, including (unfortunately) the bottom right corner that is actually behind the wall from the AP (see Figure 6-57).

Figure 6-57 Access Point/Grid Example Two (Actual Attenuation)

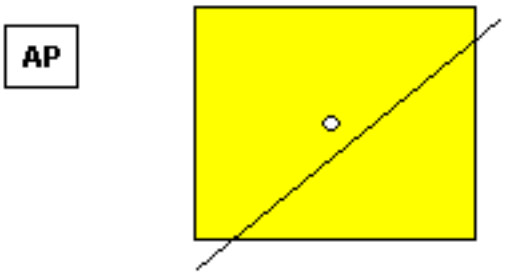
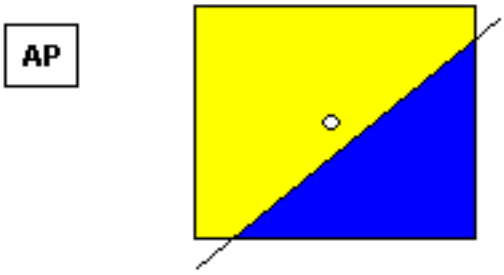


Figure 6-58 displays how the attenuation would ideally appear in this situation.

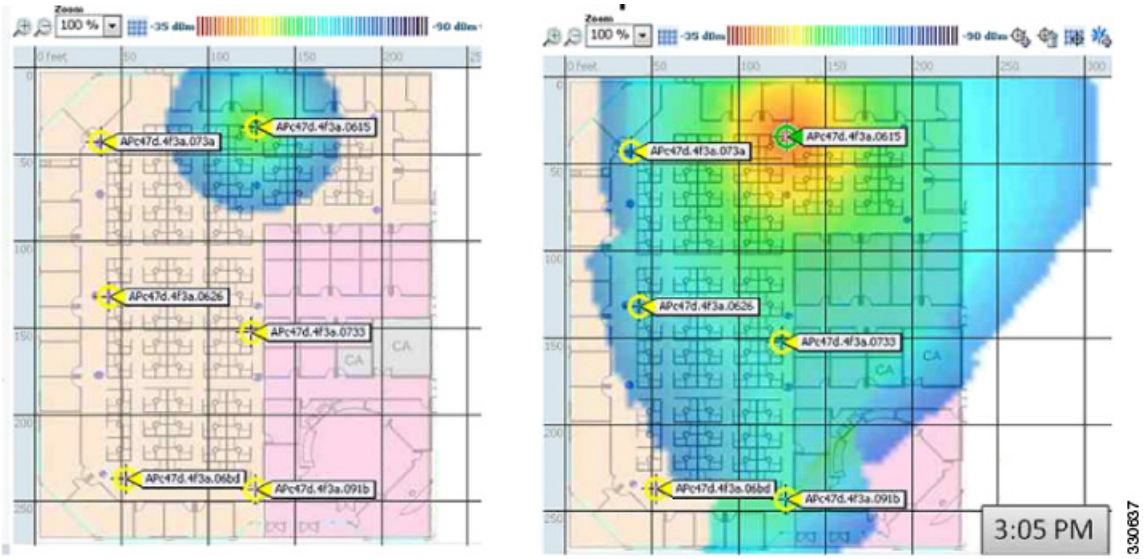
Figure 6-58 Access Point/Grid Example Two (Ideal Attenuation)



Dynamic Heatmap Calculation

The RF heatmap calculation can be static or dynamic. By default it is dynamic, to configure it to be static, disable the dynamic heatmap option in the map properties page.The NCS server maintains the current list of all APs RSSI strength for all APs. The neighbor AP RSSI strength is used to modify the RF heatmaps for all APs. The main purpose of the dynamic heatmap feature is to recompute the RF heatmaps due to obstacles. Figure 6-59 shows the difference between static and dynamic heatmaps.

Figure 6-59 Static Vs Dynamic Heatmap Calculation



Monitoring Google Earth Maps

Within Monitor > Google Earth Maps, you can create an outdoor location, import a file, view Google Earth maps, and specify Google Earth settings.

This section contains the following topics:

Creating an Outdoor Location Using Google Earth

To group the access points together into outdoor locations, use the Latitude/Longitude geographical coordinates for each access point. These coordinates are provided in two ways:

- Importing a KML (Google Keyhole Markup Language) File
- Importing a CSV File (Spreadsheet format with comma-separated values)

This section contains the following topics:

Understanding Geographical Coordinates for Google Earth

The following geographical information is required for each access point:

Note Adding an AP to Google Earth map without having the AP associated on a standard map, you do not see any heatmap when you view the AP in Google Earth.

- Longitude (East or West)—Angular distance in degrees relative to Prime Meridian. Values west of Meridian range from –180 to 0 degrees. Values east of Meridian range from 0 to 180 degrees. The default is 0.

  Coordinates in degrees, minutes, seconds, direction:

  - Degrees (–180 to 180)
  - Minutes (0 to 59)
  - Seconds (00.00 to 59.99)
  - Direction—East or West (E, W)

  Decimal format (converted from degrees, minutes, and seconds):

  - Longitude can range from –179.59.59.99 W to 179.59.59.99 E

- Latitude (North or South)—Angular distance in degrees relative to the Equator. Values south of the Equator range from –90 to 0 degrees. Values north of the Equator range from 0 to 90 degrees. The default is 0.

  Coordinates in degrees, minutes, seconds, direction:

  - Degrees (–90 to 90)
  - Minutes (0 to 59)

  - Seconds (00.00 to 59.99)
  - Direction—North or South (N, S)

  Decimal format (converted from degrees, minutes, and seconds):

  - Latitude can range from –89.59.59.99 S to 89.59.59.99 N

- Altitude—Height or distance of the access point from the surface of the earth in meters. If not provided, value defaults to 0. Values range from 0 to 99999.
- Tilt—Values range from 0 to 90 degrees (cannot be negative). A tilt value of 0 degrees indicates viewing from directly above the access point. A tilt value of 90 degrees indicates viewing along the horizon. Values range from 0 to 90. The default azimuth angle is 0.
- Range—Distance in meters from the point specified by longitude and latitude to the point where the access point is being viewed (the Look At position) (camera range above sea level). Values range from 0 to 999999.
- Heading—Compass direction in degrees. The default is 0 (North). Values range from 0 to ±180 degrees.
- Altitude Mode—Indicates how the <altitude> specified for the Look At point is interpreted.
  - Clamped to ground—Ignores the <altitude> specification and places the Look At position on the ground. This is the default.
  - Relative to ground—Interprets the <altitude> as a value in meters above the ground.
  - Absolute—Interprets the <altitude> as a value in meters above sea level.
- Extend to ground—Indicates whether or not the access point is attached to a mast.

Creating and Importing Coordinates in Google Earth (KML File)

The geographical coordinates can be created in Google Earth and imported. Either a folder or individual placemarks can be created. Creating a folder helps group all the Placemarks into a single folder and allows you to save the folder as a single KML (a.k.a. XML) file. If individual Placemarks are created, each Placemark must be individually saved.

Follow these steps to create a folder in Google Earth:

Step 1 Launch Google Earth.

Step 2 In the Places page on the left sidebar menu, choose **My Places** or **Temporary Places**.

Step 3 Right-click **Temporary Places** and select **Add > Folder** from the drop-down lists.

Note By using a KML file, folders can be created hierarchically to any depth. For example, you can create folders and placemarks organized by country, city, state, zip.
This is not applicable for CSV. In CSV there can be only one level of hierarchy.

Step 4 Enter the following information (optional):

- Name—Folder name
- Description—Folder description
- View—Includes latitude, longitude, range, heading, and tilt

Note If the View coordinates (latitude, longitude, range, heading, and tilt) are specified, this information is used to "fly" or advance to the correct location when Google Earth is first loaded.
If no coordinates are specified, the latitude and longitude information is derived using the minimum and maximum latitude and longitude of all access points within this group or folder.

Step 5 Click **OK** to save the folder. After the folder is created, it can be selected from the Places page to create Placemarks.

To create Placemarks, follow these steps:

Step 1 Launch Google Earth.

Step 2 In the Places page on the left sidebar, select **My Places** or **Temporary Places**.

Step 3 Select the folder that you previously created.

Step 4 Right-click your created folder and select **Add > Placemark** from the drop-down lists.

Step 5 Configure the following parameters, if applicable:

- Name—The Placemark name must contain the name, MAC address, or IP address of the appropriate access point.

  Note The MAC address refers to base radio MAC not Ethernet MAC.

- Latitude—Provides the current coordinate for the folder if the placemark is created inside the folder or the coordinate for the placemark (if not created inside a folder). This field is automatically filled depending on where the yellow Placemark icon is located on the map. Use your mouse to move the Placemark to the correct location or enter the correct coordinate in the Latitude text box.
- Longitude—Provides the current coordinate for the folder if the placemark is created inside the folder or the coordinate for the placemark (if not created inside a folder). This field is automatically filled depending on where the yellow Placemark icon is located on the map. Use your mouse to move the Placemark to the correct location or enter the correct coordinate in the Longitude text box.
- Description (optional)—Field is ignored by the NCS.
- Style, Color (optional)—Field is ignored by the NCS.
- View—Allows you to configure the Latitude, Longitude, Range, Heading and Tilt coordinates. See the "Understanding Geographical Coordinates for Google Earth" section on page 6-113" for more information on these geographical coordinates.
  - Longitude and latitude are automatically filled depending on where the yellow Placemark icon is located on the map. Use your mouse to click and move the Placemark to the correct location.
  - All of the coordinates can be entered manually.
- Altitude—Enter the altitude in meters in the text box or use the Ground to Space slide bar to indicate the altitude.
  - Clamped to ground—Indicates that the Look At position is on the ground. This is the default.
  - Relative to ground—Interprets the <altitude> as a value in meters above the ground.

- Absolute—Interprets the <altitude> as a value in meters above sea level.
- Extend to ground—For Relative to ground or Absolute settings, indicates whether or not the access point is attached to a mast.

Step 6 When all coordinates are entered, click **Snapshot current view** or click **Reset** to return the coordinates to the original settings.

Note For more information regarding Google Earth, see to the Google Earth online help.

Step 7 Click **OK**.

Step 8 Repeat these steps for all placemarks you want to add.

Step 9 When all placemarks are created, save the folder as a .kmz file (KML Zip file) or as a .kml file.

Note A .kmz file should contain only one .kml file.

Note To save the folder, right-click the folder, select **Save as** from the drop-down list, navigate to the correct location on your computer, and click **Save**. Both .kmz and .kml files can be imported into the NCS.

Creating and Importing Coordinates as a CSV File

To create a CSV file to import into the NCS, follow these steps:

Step 1 Open a flat file and provide the necessary information as a comma-separated list. The Table 6-15 lists the potential data, whether the data is optional or required, and the parameters of the data.

Note For more information regarding the geographical coordinates listed in Table 6-15, see the "Understanding Geographical Coordinates for Google Earth" section on page 6-113.

Table 6-15 Potential Fields for the CSV File

"FolderName"	"Value Optional"	Max Length: 32
"FolderState"	"Value Optional"	Permitted Values: true/false
"FolderLongitude"	"Value Optional"	Range: 0 to ±180
"FolderLatitude"	"Value Optional"	Range: 0 to ±90
"FolderAltitude"	"Value Optional"	Range: 0 to 99999
"FolderRange"	"Value Optional"	Range: 0 to 99999
"FolderTilt"	"Value Optional"	Range: 0 to 90
"FolderHeading"	"Value Optional"	Range: 0 to ±180
"FolderGeoAddress"	"Value Optional"	Max Length: 128

Table 6-15 Potential Fields for the CSV File (continued)

"FolderName"	"Value Optional"	Max Length: 32
"FolderGeoCity"	"Value Optional"	Max Length: 64
"FolderGeoState"	"Value Optional"	Max Length: 40
"FolderGeoZip"	"Value Optional"	Max Length: 12
"FolderGeoCountry"	"Value Optional"	Max Length: 64
"AP_Name"	"Value Required"	Max Length: 32
"AP_Longitude"	"Value Required"	Range: 0 to ±180
"AP_Latitude"	"Value Required"	Range: 0 to ±90

Step 2 Save the .csv file. The file is now ready to import into the NCS.

Importing a File into NCS

To import a Google KML or a CSV into the Google Earth Maps feature of the NCS, follow these steps:

Step 1 Log in to the NCS.

Step 2 Choose **Monitor > Google Earth Maps**.

Step 3 From the Select a command drop-down list, choose **Import Google KML** or **Import CSV**.

Step 4 Click **Go**.

Step 5 Use the Browse button to navigate to the .kml, .kmz, or .csv file on your computer.

Step 6 When the file name path is displayed in the text box, click **Next**.

The input file is parsed and validated for the following:

- Access points specified in the uploaded file are validated (the specified access points must be available within the NCS).
- Range validations are performed for tilt, heading, range, and other geographical coordinates fields.If longitude and latitudeare provided, range validations are performed; if not, the value is defaulted to 0.

Note In KML, the longitude and latitude ranges can only be entered in decimal format. In CSV, different formats are supported (see the CSV sample under Google Maps > Import CSV).

Note If the input file does not validate for completeness, an error page appears. The uploaded information cannot be saved until all errors are corrected.

Step 7 After the files pass all validation checks, review the file details and click **Save**.

If the uploaded information was saved previously, the information is overwritten accordingly:

- If the folder was uploaded previously, the coordinates are updated for the folder.

- If access points were uploaded previously, the coordinates are updated for the access points.
- Existing access points in the folder are not removed.
- New folders, as needed, are created and access points are placed accordingly.

Viewing Google Earth Maps

To view Google Earth maps, follow these steps:

Step 1 Log in to the NCS.

Step 2 Choose **Monitor > Google Earth Maps**. The Google Earth Maps page displays all folders and the number of access points included within each folder.

Step 3 Click **Launch** for the map you want to view. Google Earth opens in a separate page and displays the location and its access points.

Note To use this feature, you must have Google Earth installed on your computer and configured to auto-launch when data is sent from the server. You can download Google Earth from the Google website: http://www.google.com/earth/index.html.

Viewing Google Earth Map Details

To view details for a Google Earth Map folder, follow these steps:

Step 1 In the Google Earth Map page, click the folder name to open the details page for this folder. The Google Earth Details provide the access point names and MAC or IP addresses.

Note To delete an access point, select the applicable check box and click **Delete**.
To delete the entire folder, select the check box next to **Folder Name** and click **Delete**. Deleting a folder also deletes all subfolders and access points inside the folder.

Step 2 Click **Cancel** to close the details page.

Adding Google Earth Location Launch Points to Access Point Pages

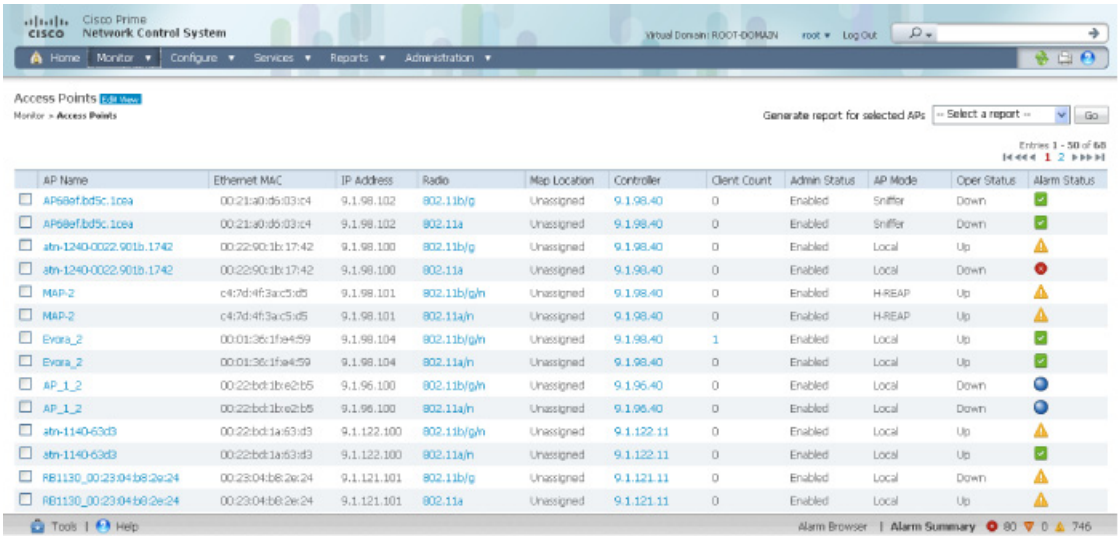
You can expand the number of Google Earth Location launch points within the NCS by adding it to the Access Point summary and detail pages.

To add a Google Earth Location launch point to the Access Point summary and details page, follow these steps:

Step 1 Choose **Monitor > Access Points** (see Figure 6-60).

Step 2 In the Access Point summary page, click the **Edit View** link next to page heading.

Figure 6-60 Monitor > Access Points Page



Step 3 In the Edit View page, highlight **Google Earth Location** in the left-hand column. Click **Show**.

The Google Earth Location column heading moves into the View Information column.

Note The View Information listings, top-to-bottom, reflect the left-to-right order of the columns as they appear on the Access Point summary page.

Step 4 To change the display order of the columns, highlight the Google Earth Location entry and click the **Up** and **Down** buttons as needed. Click **Submit**.

You are returned to the Access Points summary page, and a Google Earth launch link is in the display.

Note The launch link also appears in the general summary page of the Access Points details page (Monitor > Access Points > *AP Name)*.

Google Earth Settings

Access point related settings can be defined from the Google Earth Settings page. To configure access point settings for the Google Earth Maps feature, follow these steps:

Step 1 Choose **Monitor > Google Earth Maps**.

Step 2 Configure the following parameters:

- Refresh Settings—Select the **Refresh from Network** check box to enable this on-demand refresh. This option is applied only once and then disabled.

Caution Because this refresh occurs directly from the network, it could take a long period of time to collect data according to the number of access points.

- Layers—Layer filters for access points, access point heat maps, and access point mesh information can be selected and saved. Select the check box to activate the applicable layer and click **>** to open the filter page.

  Note These settings apply when Google Earth sends the request for the next refresh.

  - Access Points—From the AP Filter drop-down list, choose to display channels, Tx power level, coverage holes, MAC addresses, names, controller IP, utilization, profiles, or clients.

    Note If the access point layer is not checked, no data is returned, and an error message is returned to Google Earth as a Placemark without an icon.

  - AP Heatmap—From the Protocol drop-down list, choose 802.11a/n, 802.11b/g/n, 802.11a/n & 802.11b/g/n, or None. Select the cutoff from the RSSI Cutoff drop-down list (- 60 to - 90 dBm).

    Note If the protocol chosen is both 802.11a/n and 802.11b/g/n, the heat maps are generated for both and overlaid on top of each other. The order cannot be defined. To prevent this overlay, you must turn off individual overlay in Google Earth or change it in the Google Earth Settings on the NCS.

  - AP Mesh Info—Choose Link SNR, Packet Error Rate, or none from the Link Label drop-down list. Choose Link SNR or Packet Error Rate from the Link Color drop-down list.

    Note When the AP Mesh Info check box is chosen, Mesh Links are also automatically shown.

Step 3 Click **Save Settings** to confirm these changes or **Cancel** to close the page without saving the changes.