

## Context-Aware Service Planning and Verification

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This chapter describes a number of tools and configurations that can be used to enhance the location accuracy of elements (clients, tags, rogue clients, interferers, and rogue access points) within an indoor or outdoor area.

This chapter contains the following sections:

- [Licensing Requirements, page 9-1](#)
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## Licensing Requirements

You must purchase licenses from Cisco to retrieve contextual information on tags and clients from access points. Licenses for tags and clients are offered separately. (The clients license also includes tracking of rogue clients and rogue access points).

For more information, see the *Cisco 3300 Series Mobility Services Engine Licensing and Ordering Guide* at [http://www.cisco.com/en/US/products/ps9742/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps9742/products_data_sheets_list.html).

For details on adding client and tag licenses to the mobility services engine, see [Chapter 2, “Adding and Deleting Mobility Services Engines and Licenses”](#).

## Guidelines and Limitations

- Context-Aware Service (CAS) installed on a mobility services engine retrieves location information as well as other contextual information such as temperature and asset availability about a client or tag (Cisco CX Version 1 or later) from access points.
- Non-Cisco CX tags are not tracked or mapped by the Cisco Prime Infrastructure.
- Context-Aware Service was previously referred to as Cisco location-based services.

## Planning Data, Voice, and Location Deployment

You can calculate the recommended number and location of access points based on the services (data, voice, location, or a combination) that are active.

This section contains the following topics:

- [Guidelines and Limitations, page 9-2](#)
- [Calculating the Placement of Access Points, page 9-2](#)

## Guidelines and Limitations

- Access points, clients, and tags must be selected in the Floor Settings menu of the Monitor > Site MAPs page to appear on the map.
- Recommended calculations assume the need for consistently strong signals. In some cases, fewer access points may be required than recommended.
- You must select the Location Services to ensure that the recommended access points provide the true location of an element within 7 meters at least 90% of the time.

## Calculating the Placement of Access Points

To calculate the recommended number and placement of access points on a floor, follow these steps:

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

The Site Map page appears.

**Step 2** Click the appropriate map name link in the summary list that appears.

If you selected a building map, select a floor map in the Building View page.

A color-coded map appears showing placement of all installed elements (access points, clients, tags) and their relative signal strength.




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**Note** The Access Points, Clients, and 802.11 Tags check boxes must be selected in the Floor Settings dialog box of the Monitor > Site Maps page to appear on the map.

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**Step 3** Choose **Planning Mode** from the Select a command drop-down list (top-right) and click **Go**.

A map appears with planning mode options at the top of the page.

**Step 4** Click **Add APs**.

In the page that appears, drag the dashed rectangle over the map location for which you want to calculate the recommended access points.



**Note** Adjust the size or placement of the rectangle by selecting the edge of the rectangle and holding down the **Shift** key. Move the mouse as necessary to outline the targeted location.

**Step 5** Select the check box next to the service that is used on the floor. The options are Data/Coverage (default), Voice, Location, and Location with Monitor Mode APs. Click **Calculate**.

The recommended number of access points appears.



**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 number of access points required.

**Step 6** Click **Apply** to generate a map based on the recommended number of access points and their proposed placement in the selected area.

## Calibration Models

### Information on Calibration Models

If the provided RF models do not sufficiently characterize your floor layout, you can create and apply a calibration model to your floor that better represents its attenuation characteristics. In environments in which many floors share common attenuation characteristics (such as in a library), you can create one calibration model and apply it to floors with the same physical layout and same deployment.

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

- Data point collection—Selects calibration points and calculates their coverage area one location at a time.
- Linear point collection—Selects a series of linear paths and then calculates the coverage area as you traverse the path. This approach is generally faster than data point collection. You can also employ data point collection to augment location data missed by the linear paths.

This section contains the following topics:

- [Guidelines and Limitations, page 9-3](#)
- [Creating and Applying Data Point and Calibration Models, page 9-4](#)

### Guidelines and Limitations

- Calibration models can only be applied to clients, rogue clients, and rogue access points. Calibration for tags is done using the AeroScout System Manager. For more information on tag calibration, see the documentation available at the following URL: <http://support.aeroscout.com>.

- We recommend a 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 Prime Infrastructure and perform the calibration process.
- Use only associated clients to collect calibration data.
- Rotate the calibrating client laptop during data collection so that the client is detected evenly by all access points in the vicinity.
- Do not stop data collection until you reach the endpoint even if the data collection bar indicates completion.
- It is generally observed that the point calibration gives more accurate calibration than line calibration.

## Creating and Applying Data Point and Calibration Models

To create and apply data point and linear calibration models, follow these steps:

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

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

The RF Calibration Models page displays a list of calibration models. The default calibration model is available in all the virtual domains.

**Step 3** From the Select a command drop-down list, choose **Create New Model**. Click **Go**.

**Step 4** Assign a name to the model in the Model Name text box. Click **OK**.

The new model appears along with the other RF calibration models, but its status is listed as *Not yet calibrated*.

**Step 5** To start the calibration process, click the **Model Name** link. A new page appears showing the details of the new model.




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**Note** In this page, you can rename and delete the calibration model by choosing the proper option from the Select a command list drop-down list. When renaming the model, enter the new name before selecting **Rename Model**.

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**Step 6** From the Select a command drop-down list, choose **Add Data Points**, and click **Go**.

The campus, building, and floors displayed on this page are filtered based on the virtual domain.

**Step 7** If you are performing this process from a mobile device connected to the Prime Infrastructure through the Cisco Centralized architecture, the MAC address text box is automatically populated with the address of the device. Otherwise, you can manually enter the MAC address of the device you are using to perform the calibration. MAC addresses that are manually entered must be delimited with colons (such as FF:FF:FF:FF:FF:FF).




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

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- Step 8** Choose the appropriate campus, building, floor, or outdoor area where the calibration is to be performed. Click **Next**.



**Note** The calibration in Outdoor Area is supported in Release 7.0.200.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 9** When the chosen floor map and access point locations appear, a grid of plus marks (+) indicates the locations where data is collected for calibration.

Using these locations as guidelines, you can perform either a point or linear data collection 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 appear.

- a. To perform a point collection, follow these steps:
1. From the Collection Method drop-down list, choose **Point**, and select the **Show Data Points** check box if not already selected. A Calibration Point pop-up menu appears on the map.
  2. Position the tip of the Calibration Point pop-up at a data point (+), and click **Go**. A page appears showing the progress of the data collection.
  3. 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 sidebar menu. 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, 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.

4. Repeat point collection Steps a1 to a3 until the calibrations status bars 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 at least 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.

- b. To perform a linear collection, follow these steps:
1. From the Collection Method drop-down list, choose **Linear** 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.
  2. Position the tip of the Start pop-up at the starting data point.
  3. Position the Finish pop-up at the ending data point.

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



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

5. Press the space bar (or press **Done** in the data collection page) when you reach the endpoint. The collection dialog box shows 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 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.



**Note** The coverage area is color-coded and corresponds with the specific wireless LAN standard (802.11a/n, 802.11b/g/n, or 802.11a/b/g/n) used to collect that data (See legend in the left pane).

6. Repeat Steps b2 to b5 until the status bar for the respective spectrum is complete.



**Note** You can augment linear collection with data point collection to address missed coverage areas. See [Step 9 a](#).

- Step 10** To calibrate the data points, click the name of the calibration model at the top of the page. The main page for that model appears.
- Step 11** From the Select a command drop-down list, choose **Calibrate**, and click **Go**.
- Step 12** Click **Inspect Location Quality** when calibration completes. A map appears showing RSSI readings.
- Step 13** 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). Choose **Monitor > Site Maps** and find the floor. At the floor map interface, choose **Edit Floor Area** from the drop-down list, and click **Go**.
- Step 14** 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 locations are determined using the specific collected attenuation data from the calibration model.

# Inspecting Location Readiness and Quality

You can configure the Prime Infrastructure to verify the ability of an existing access point deployment to estimate the true location of a client, rogue client, rogue access point, or tag within 7 meters at least 90% of the time. Location readiness calculation is determined by the number and placement of access points.

This section contains the following topics:

- [Guidelines and Limitations, page 9-7](#)
- [Inspecting Location Readiness Using Access Point Data, page 9-7](#)
- [Inspecting Location Quality Using Calibration Data, page 9-8](#)

## Guidelines and Limitations

### Inspecting Location Readiness Using Access Point Data

By using data points gathered during a physical inspection and calibration, you can verify that a location meets the location specification (7 meters, 90%).

## Inspecting Location Readiness Using Access Point Data

To inspect location readiness using access point data, follow these steps:

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

**Step 2** Choose the appropriate floor location link from the list.

A map appears showing the placement of all installed access points, clients, and tags and their relative signal strength.

**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, 802.11 tags, access points, and interferers are not displayed, verify that their respective check boxes are selected on the left sidebar menu. Additionally, licenses for both clients and tags must be purchased for each of them to be tracked. For more information, see the *Cisco 3300 Series Mobility Services Engine Licensing and Ordering Guide* at [http://www.cisco.com/en/US/products/ps9742/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps9742/products_data_sheets_list.html).

**Note**

See [Chapter 2, “Adding and Deleting Mobility Services Engines and Licenses,”](#) for details on installing client and tag licenses.

**Step 3** From the Select a command drop-down list, choose **Inspect Location Readiness**, and 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 and 90% location specification.

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## 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:

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- Step 1** Choose **Monitor > Site Maps**.
  - Step 2** From the Select a command drop-down list, choose **RF Calibration Model**. Click **Go**.  
A list of defined 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** Click the **Inspect Location Quality** link.  
A color-coded map noting the percentage of location errors appears.



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

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## Verifying Location Accuracy

By verifying location accuracy, you are ensuring that the existing access point deployment can estimate the location accuracy of the deployment.

You can analyze the location accuracy of non-rogue and rogue clients, asset tags, and interferers by using the Location Accuracy Tool.

The Location Accuracy Tool enables you to run either a scheduled or on-demand location accuracy test. Both tests are configured and executed through a single window.

There are two ways to test location accuracy using the Location Accuracy Tool:



- **Scheduled Accuracy Testing**—Employed when clients and tags are already deployed and associated to the wireless LAN infrastructure. Scheduled tests can be configured and saved when clients and tags are already pre-positioned so that the test can be run on a regularly scheduled basis.
- **On-Demand Accuracy Testing**—Employed when elements are associated but not pre-positioned. On demand testing allows you to test the location accuracy of clients, tags, and interferers at a number of different locations. It is generally used to test the location accuracy for a small number of clients, tags and interferers.

**Note**

The Accuracy Tool enables you to run either a scheduled or on-demand location accuracy test. Both tests are configured and executed through a single page.

This section contains the following topics:

- [Using Scheduled Accuracy Testing to Verify Current Location Accuracy, page 9-9](#)
- [Using On-Demand Location Accuracy Testing, page 9-10](#)

## Using Scheduled Accuracy Testing to Verify Current Location Accuracy

To configure a scheduled accuracy test, follow these steps:

- Step 1** Choose **Tools > Location Accuracy Tool**.
- Step 2** From the Select a command drop-down list, choose **New Scheduled Accuracy Test**.  
The campus, building, and floors are displayed on this page are filtered based on the virtual domain.
- Step 3** Enter a test name.
- Step 4** Choose an area type from the drop-down list.
- Step 5** Campus is configured as system campus by default. There is no need to change this setting.
- Step 6** Choose the building from the drop-down list.
- Step 7** Choose the floor from the drop-down list.
- Step 8** Select the begin and end time of the test by entering the days, hours, and minutes. Hours are represented using a 24-hour clock.

**Note**

When entering the test start time, be sure to allow enough time to position testpoints on the map prior to the test start.

- Step 9** Select the destination point for the test results. You can have the report e-mailed to you or you can download the test results from the Accuracy Tests > Results page. Reports are in PDF format.

**Note**

If you select the e-mail option, an SMTP mail server must first be defined for the target e-mail address. Choose **Administrator > Settings > Mail Server Configuration** to enter the appropriate information.

- Step 10** Click **Position Testpoints**. The floor map appears with a list of all clients and tags on that floor with their MAC addresses.
- Step 11** Select the check box next to each client and tag for which you want to check the location accuracy.

When you select the MAC address check box for a client or tag, two overlapping icons appear on the map for that element.

One icon represents the actual location and the other the reported location.



**Note** To enter a MAC address for a client or tag that is not listed, select the **Add New MAC** check box, enter the MAC address, and click **Go**. An icon for the element appears on the map. If the newly added element is on the mobility services engine but on a different floor, the icon appears in the left corner (0,0) position.

**Step 12** If the actual location for an element is not the same as the reported location, drag the actual location icon for that element to the correct position on the map.



**Note** Only the actual location icon can be dragged.

**Step 13** Click **Save** when all elements are positioned. A dialog box appears confirming successful accuracy testing.

**Step 14** Click **OK** to close the confirmation page. You are returned to the Accuracy Tests summary page.



**Note** The accuracy test status appears as **Scheduled** when the test is about to execute. A status of **In Progress** appears when the test is running and **Idle** when the test is complete. A **Failure** status appears when the test is not successful.

**Step 15** To view the results of the location accuracy test, click **Test name** and then click the **Results** tab in the page that appears.

**Step 16** In the Results page, click the **Download** link under the Saved Report heading to view the report.

The Scheduled Location Accuracy Report includes the following information:

- A summary location accuracy report that details the percentage of elements that fell within various error ranges
- An error distance histogram
- A cumulative error distribution graph
- An error distance over time graph
- A summary by each MAC address whose location accuracy was tested noting its actual location, error distance and a map showing its spatial accuracy (actual vs. calculated location) and error distance over time for each MAC.

## Using On-Demand Location Accuracy Testing

An on-demand accuracy test is run when elements are associated but not pre-positioned. On-demand testing allows you to test the location accuracy of clients and tags at a number of different locations. You generally use it to test the location accuracy for a small number of clients and tags.

To run an on-demand accuracy test, follow these steps:

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- Step 1** Choose **Tools > Location Accuracy Tool**.
- Step 2** From the Select a command drop-down list, choose **New On demand Accuracy Test**.
- Step 3** Enter a test name.
- Step 4** Choose the area type from the drop-down list.
- Step 5** Campus is configured as system campus by default. There is no need to change this setting.
- Step 6** Choose the building from the drop-down list.
- Step 7** Choose the floor from the drop-down list.
- Step 8** View the test results in the Accuracy Tests > Results page. Reports are in PDF format.
- Step 9** Click **Position Testpoints**. The floor map appears with red cross hairs at the (0,0) coordinate.
- Step 10** To test the location accuracy and RSSI of a location, choose either **client** or **tag** from the drop-down list on the left. A list of all MAC addresses for the chosen option (client or tag) appears in a drop-down list to its right.
- Step 11** Choose a MAC address from the drop-down list, move the red cross hairs to a map location, and click the mouse to place it.
- Step 12** Click **Start** to begin collecting accuracy data.
- Step 13** Click **Stop** to finish collecting data. You should allow the test to run for at least two minutes before clicking Stop.
- Step 14** Repeat [Step 10](#) to [Step 13](#) for each testpoint that you want to plot on the map.
- Step 15** Click **Analyze** when you are finished mapping the testpoints.
- Step 16** Click the **Results** tab in the page that appears.
- The on-demand accuracy report includes the following information:
- A summary location accuracy report that details the percentage of elements that fell within various error ranges
  - An error distance histogram
  - A cumulative error distribution graph
- Step 17** To download accuracy test logs from the Accuracy Tests summary page:
- a. Select the **listed test** check box and choose either **Download Logs** or **Download Logs for Last Run** from the Select a command drop-down list.
  - b. Click **Go**.
- The Download Logs option downloads the logs for all accuracy tests for the selected test(s).
- The Download Logs for Last Run option downloads logs for only the most recent test run for the selected test(s).
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# Using Optimized Monitor Mode to Enhance Tag Location Reporting

To optimize monitoring and location calculation of tags, you can enable TOMM (Tracking Optimized Monitor Mode) on up to four channels within the 2.4-GHz band (802.11b/g radio) of an access point. This allows you to focus channel scans only on those channels on which tags are usually programmed to operate (such as channels 1, 6, and 11).

You must enable monitor mode at the access point level before you can enable TOMM and assign monitoring channels on the 802.11 b/g radio of the access point.

This section contains the following topics:

- [Guidelines and Limitations, page 9-12](#)
- [Optimizing Monitoring and Location Calculation of Tags, page 9-12](#)

## Guidelines and Limitations

You can configure fewer than four channels for monitoring.

## Optimizing Monitoring and Location Calculation of Tags

To optimize monitoring and location calculation of tags, follow these steps:

**Step 1** Enable monitor mode on the access point, by following these steps:

- Choose **Configure > Access Point > AP Name**.
- Select **Monitor** as the AP Mode.



**Note**

For more details, see to the *Cisco Wireless Control System Configuration Guide, Release 7.0* at the following URL:  
[http://www.cisco.com/en/US/products/ps6305/products\\_installation\\_and\\_configuration\\_guides\\_list.html](http://www.cisco.com/en/US/products/ps6305/products_installation_and_configuration_guides_list.html)

**Step 2** Enable TOMM and assign monitoring channels on the access point radio, by following these steps:

- After enabling monitor mode at the access point level, choose **Configure > Access Points**.
- At the Access Points summary page, click the **802.11 b/g Radio** link for the access point on which monitor mode is enabled.
- In the Radio details page, disable Admin Status by unselecting the check box. This disables the radio.
- Select the **Enable TOMM** check box.
- Select up to four channels (Channel 1, Channel 2, Channel 3, Channel 4) on which you want the access point to monitor tags.



**Note**

To eliminate a monitoring channel, choose **None** from the channel drop-down list.

- f. Click **Save**.
  - g. In the Radio parameters page, reenable the radio by selecting the **Admin Status** check box.
  - h. Click **Save**. The access point is now configured as a TOMM access point.  
The AP Mode appears as Monitor in the Monitor > Access Points page.
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## Defining Inclusion and Exclusion Regions on a Floor

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

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

This section contains the following topics:

- [Guidelines and Limitations, page 9-13](#)
- [Defining an Inclusion Region on a Floor, page 9-14](#)
- [Defining an Exclusion Region on a Floor, page 9-16](#)

### Guidelines and Limitations

Consider the following when configuring exclusion and inclusion areas:

- In the Prime Infrastructure, inclusion and exclusion regions are calculated only for clients.
- Inclusion and exclusion areas can be any polygon shape and must have at least three points.
- You can define only one inclusion region on a floor. By default, an inclusion region is defined for each floor when it is added to the Prime Infrastructure. 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.

This might cause some of the devices to be located outside inclusion regions or inside exclusion regions till their location is calculated again.

- You must select the Location Regions option in the Floor Settings menu of the Monitor > Site Maps page for inclusion and exclusion regions to appear on the map.

### Opening the Map Editor

Follow these steps to use the map editor:

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- Step 1** Choose **Design > Site Map Design**.
  - 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.
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## Using the Map Editor to Draw Coverage 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 coverage area.

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- Step 1** Add the floor plan if it is not already represented in the Prime Infrastructure.
- Step 2** Choose **Design > 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** In the Map Editor page, click the **Draw Coverage Area** icon on the toolbar.  
A pop-up menu appears.
- 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.
- The outlined area must be a closed object to appear highlighted on the map.
- Step 8** Click the **disk** icon on the toolbar to save the newly drawn area. Click the **Map Name** that corresponds to the outdoor area, campus, building, or floor you want to edit.
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## Defining an Inclusion Region on a Floor

To define an inclusion region, follow these steps:

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- Step 1** Choose **Design > Site Maps**.
- Step 2** Click the name of the appropriate floor.
- Step 3** From the Select a command drop-down list, choose **Map Editor**, and click **Go**.
- Step 4** In the map, click the aqua box on the toolbar.  
The Location Region Creation pop up window appears.
- Step 5** Select Inclusion from the Location Region Type drop-down list and click **OK**.  
A drawing icon appears to outline the inclusion area.
- Step 6** To begin defining the inclusion area, move the drawing icon to a starting point on the map and click once.

- Step 7** Move the mouse 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 8** Repeat [Step 7](#) until the area is outlined and then double-click the drawing icon. A solid aqua line defines the inclusion area (see [Figure 9-1](#)).

**Figure 9-1 Inclusion Area Defined**

**Map Editor : Floor 'Cisco > Building14 > FourthFloor'**

To resize based on available browser space [click here](#)

Note: Please recompute RF prediction (Command -> Recompute Prediction) when Rails or Regions are modified for WCS Location.



- Step 9** Click the **disk** icon on the toolbar to save the inclusion region.



**Note**

If you made an error in defining the inclusion area, you can edit the area using the Edit Mode option available. In the Next generation map editor, you can choose Edit Mode and click on the area to be edited and drag the vertices or hold down the mouse key and move the entire area to a different place.

- Step 10** Select the Location Regions check box if not already selected. If you want to apply it to all floor maps, click Save Settings. Close the Layers configuration page.
- Step 11** To resynchronize the Prime Infrastructure and MSE database, choose **Services > Synchronize Services**.



**Note**

If 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 12** In the Synchronize Prime Infrastructure and MSE(s) page, click the **Network Designs** tab, and click **Synchronize**.
- View the Sync. Status column to ensure that the synchronization is successful (two green arrows indicate success).

**Note**

- If the floor was already assigned previously to a mobility services engine, the changes on the floor are auto synchronized to the mobility services engine.
- For location calculation of an element, the rails and regions take effect only after the location is recalculated.
- Inclusion region configurations do not apply to tags.

**Note**

To delete an inclusion area, click the **Delete Mode** icon and select the region you want to delete and click the **Delete** button.

## Defining an Exclusion Region on a Floor

To further refine location calculations on a floor, you can define regions that are excluded (exclusion regions) in the calculations. Exclusion regions are generally defined within the borders of an inclusion region.

**Note**

Exclusion region configurations do not apply to tags.

To define an exclusion region, follow these steps:

- Step 1** Choose **Design > 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**, and click **Go**.
- Step 4** In the map, click the purple box on the toolbar.
- The Location Region Creation pop up window appears.
- Step 5** Select **Exclusion** from the Location Region Type drop-down list and click **OK**.
- A drawing icon appears to outline the exclusion area.
- Step 6** To begin defining the exclusion area, move the drawing icon to the starting point on the map and click once.
- Step 7** Move the drawing icon along the boundary of the area you want to exclude and click once to start a boundary line and click again to end the boundary line.
- Step 8** Repeat [Step 7](#) 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 9** To define additional exclusion regions, repeat [Step 4](#) to [Step 8](#).
- Step 10** 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 11** To return to the floor map to enable exclusion regions on heatmaps, choose **Exit** from the Command menu.
- Step 12** At the floor map, select the **Location Regions** check box if it is not already selected. The exclusion region is shown on the map.
- Step 13** To resynchronize the Prime Infrastructure and location databases, choose **Services > Synchronize Services**.
- Step 14** In the Synchronize page, from the Synchronize drop-down list, choose **Network Designs**, and then click **Synchronize**.
- View the Sync. Status column to ensure that the synchronization is successful (two green arrows indicate success).

**Note**

- Exclusion region auto synchronizes with the mobility services engine if the floor was already synchronized to the mobility services engine.
- You can draw multiple exclusion regions within an inclusion region.
- For location calculation of an element, the rails and regions take effect only after the location is recalculated.

## Defining a Rail Line on a Floor

You can define a rail line on a floor (such as a conveyor belt) that indicates an area where clients are expected to be.

Additionally, you can define an area (east and west or north and south) of the rail that expands the area that clients are expected to populate. This expanded area is known as the *snap-width* and further assists location calculations. Any client located within the snap-width area is plotted on the rail line (majority) or just outside of the snap-width area (minority).

This section contains the following topics:

- [Guidelines and Limitations, page 9-17](#)
- [Defining a Rail on a Floor, page 9-18](#)

## Guidelines and Limitations

- Rail line configurations do not apply to tags.
- Rails auto synchronize with the mobility services engine if the floor was already synchronized to the mobility services engine.
- For location calculation of an element, the rails and regions take effect only after the location is recalculated.

## Defining a Rail on a Floor

The snap-width area is defined in feet or meters (user-defined).

To define a rail on a floor, 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**, and click **Go**.
  - Step 4** Click the rail icon (to the right of the purple exclusion icon) on the toolbar.
  - Step 5** In the dialog box that appears, enter a snap-width (feet or meters) for the rail and then click **OK**.
  - Step 6** When the drawing icon appears, 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 7** 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 both sides 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 8** To return to the floor map, choose the **Switch to floor view** icon.
- Step 9** In the floor map, select the **Rails** check box in the Floor Settings menu if it is not already selected. The rail is shown on the map.
- Step 10** To resynchronize the Prime Infrastructure and mobility services engine, choose **Services > Synchronize Services**.
- Step 11** In the Synchronize Services page, from the Synchronize drop-down list, choose **Network Designs** and then click **Synchronize**.

Look at the Sync. Status column to ensure that the synchronization is successful (two green arrows indicate success).

---

## Adding an Outdoor Area




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**Note** You can add an outdoor area to a campus map in the Prime Infrastructure 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 Prime Infrastructure automatically resizes the map to fit the workspace.

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

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

**Step 4** From the Select a command drop-down list, choose **New Outdoor Area**, and click **Go**.  
The Create New Area page appears.

**Step 5** 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 6** Click Next.

**Step 7** Click **Place** to put the outdoor area on the campus map. The Prime Infrastructure creates an outdoor area rectangle scaled to the size of the campus map.

**Step 8** Click and drag the outdoor area rectangle to the desired position on the campus map.

**Step 9** 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 10** (Optional) To assign location presence information for the new outdoor area, choose **Edit Location Presence Info**, and click **Go**.

**Note**

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

## Configuring Interferer Notifications

You can configure this feature only from the campus, building, and floor view page.

To configure interferer notification, follow these steps:

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

**Step 2** Click the name of the appropriate floor, building, or campus area.

**Step 3** From the Select a command drop-down list, choose **Configure Interferer Notifications**, and click **Go**.  
The Interferer CAS notification Configuration page appears. The following devices are displayed:

- Bluetooth Link
- Microwave Oven
- 802.11FH
- Bluetooth Discovery
- TDD Transmitter
- Jammer
- Continuous Transmitter
- DECT like Phone
- Video Camera
- 802.15.4
- WiFi Inverted
- WiFi Invalid channel
- Super AG
- Radar
- Canopy
- Xbox
- WiMAX Mobile
- WiMAX Fixed

**Step 4** Select the devices check box for which you want notifications to be generated.

**Step 5** Click **Save**.

## Using Planning Mode

The planning mode opens the map editor in the browser window from which the planning tool is launched. If the original browser window has navigated away from the floor page, you need to navigate back to the floor page to launch the map editor.

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.

Planning Mode options:

- Add APs—Enables you to add access points on a map.
- Delete APs—Deletes the selected access points.
- Map Editor—Opens the Map Editor window. See the [“Defining Inclusion and Exclusion Regions on a Floor”](#) section on page 9-13 for 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 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, then they are 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 area, get positioned to the given floor. One MAC address cannot be put into a 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.

## Modifying Context-Aware Service Parameters

You can specify the type and number of clients or tags that are tracked and whether or not locations are calculated for those clients or tags.

You can also modify parameters that affect the location calculation of clients and tags such as Receiver Signal Strength Indicator (RSSI) measurements. Disable tracking and reporting of ad hoc rogue clients and access points.

This section contains the following topics:

- [Licensing Requirements, page 9-21](#)
- [Guidelines and Limitations, page 9-22](#)
- [Modifying Tracking Parameters, page 9-22](#)
- [Modifying Filtering Parameters, page 9-26](#)
- [Modifying History Parameters, page 9-28](#)
- [Enabling Location Presence, page 9-30](#)
- [Importing Asset Information, page 9-31](#)
- [Exporting Asset Information, page 9-32](#)
- [Modifying Location Parameters, page 9-32](#)

## Licensing Requirements

Licenses are required to retrieve contextual information on tags and clients from access points. The license of the client also includes tracking of rogue clients and rogue access points. Licenses for tags and clients are offered independently and are offered in a range of quantities, from 3,000 to 12,000 units. For more information, see the *Cisco 3300 Series Mobility Services Engine Licensing and Ordering Guide* at [http://www.cisco.com/en/US/products/ps9742/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps9742/products_data_sheets_list.html).

## Guidelines and Limitations

The Cisco 3315 Mobility Services Engine supports up to 2,000 clients and tags, and the Cisco 3350 Mobility Services Engine supports up to 18,000 clients and tags.

## Modifying Tracking Parameters

The mobility services engine can track up to 18,000 clients (including rogue clients, rogue access points, wired clients, and interferers) and tags (combined count) with the proper license purchase and mobility services engine. Updates on the locations of tags, clients, and interferers being tracked are provided to the mobility services engine from the controller.

Only those tags, clients, and interferers that the controller is tracking are seen in the Prime Infrastructure maps, queries, and reports. No events and alarms are collected for non-tracked elements and none are used in calculating the 18,000 element limit for clients or tags.

You can modify the following tracking parameters using the Prime Infrastructure:

- Enable and disable wired and wireless client stations, active asset tags, and rogue clients, interferers, and access points whose locations you actively track.

Wired client location tracking enables servers in a data center to more easily find wired clients in the network. Servers are associated with wired switch ports in the network.

- Set limits on how many of a specific element you want to track.

For example, given a client license of 12,000 trackable units, you can set a limit to track only 8,000 client stations (leaving 4,000 units available to allocate between rogue clients and rogue access points). Once the tracking limit is met for a given element, the number of elements not being tracked is summarized in the Tracking Parameters page.

This section contains the following topics:

- [Guidelines and Limitations, page 9-22](#)
- [Configuring Tracking Parameters for a Mobility Services Engine, page 9-22](#)

## Guidelines and Limitations

- When upgrading mobility services engines from Release 6.0 to 7.0, if any limits have been set on wireless clients or rogues, they are reset because of the wired client limit change in Release 7.0.
- The actual number of tracked clients is determined by the license purchased.
- The actual number of tracked active RFID tags is determined by the license purchased.
- We recommend that you use a Release 4.2 or higher controller for better latency and accuracy.


## Configuring Tracking Parameters for a Mobility Services Engine

To configure tracking parameters for a mobility services engine, follow these steps:

- 
- Step 1** Choose **Services > Mobility Services Engine**. The Mobility Services page appears.
- Step 2** Click the name of the mobility services engine whose properties you want to edit. The General Properties page appears.

- Step 3** Choose **Context Aware Service > Administration > Tracking Parameters** to display the configuration options.
- Step 4** Modify the tracking parameters as appropriate. [Table 9-1](#) lists the tracking parameters.

**Table 9-1**      **Tracking Parameters**


Field	Configuration Options
Tracking Parameters	
Wired Clients	<ol style="list-style-type: none"> <li>1. Select the <b>Enable</b> check box to enable tracking of client stations by the mobility services engine.  In Release 7.0, the client license encompasses all network location service elements and is shared among wireless clients, wired clients, rogue clients, access points, and interferers.  The wired client limiting is supported from mobility services engine 7.0 and Prime Infrastructure Release 7.0 and later. In other words, you can limit wired clients to a fixed number such as 500. This limit is set to ensure that the licenses are not taken up completely by wired clients and some licenses are available for wireless clients.</li> </ol> <div style="text-align: center;">  </div> <p><b>Caution</b> When upgrading the mobility services engine from Release 6.0, if any limits have been set on wireless clients or rogues, they are reset because of the wired client limit change in Release 7.0.</p> <p><b>Note</b> Active Value (Display only): Indicates the number of wired client stations currently being tracked.</p> <p><b>Note</b> Not Tracked (Display only): Indicates the number of wired client stations beyond the limit.</p>
Wireless Clients	<ol style="list-style-type: none"> <li>1. Select the <b>Enable</b> check box to enable tracking of client stations by the mobility services engine.</li> <li>2. Select the <b>Enable Limiting</b> check box to set a limit on the number of client stations to track.</li> <li>3. Enter a Limit Value if limiting is enabled. The limit entered can be any positive value up to 18,000 which is the maximum number of clients that can be tracked by a mobility services engine.</li> </ol> <p><b>Note</b> Active Value (Display only): Indicates the number of client stations currently being tracked.</p> <p><b>Note</b> Not Tracked (Display only): Indicates the number of client stations beyond the limit.</p>

**Table 9-1** *Tracking Parameters (continued)*

Field	Configuration Options
Rogue Access Points	<ol style="list-style-type: none"> <li>1. Select the <b>Enable</b> check box to enable tracking of rogue access points by the mobility services engine.</li> <li>2. Select the <b>Enable Limiting</b> check box to set a limit on the number of rogue access points to track.</li> <li>3. Enter a Limit Value if limiting is enabled. The limit entered can be any positive value up to 18,000 which is the maximum number of rogue access points that can be tracked by a mobility services engine.</li> </ol> <p><b>Note</b> Active Value (Display only): Indicates the number of rogue access points currently being tracked.</p> <p><b>Note</b> Not Tracked (Display only): Indicates the number of rogue access points beyond the limit.</p>
Exclude Ad-Hoc Rogues	Select the check box to turn off the tracking and reporting of ad hoc rogues in the network. As a result, ad hoc rogues are not displayed on Prime Infrastructure maps or its events and alarms reported.
Rogue Clients	<ol style="list-style-type: none"> <li>1. Select the <b>Enable</b> check box to enable tracking of rogue clients by the mobility services engine.</li> <li>2. Select the <b>Enable Limiting</b> check box to set a limit on the number of rogue clients to track.</li> <li>3. Enter a Limit Value if limiting is enabled. The limit entered can be any positive value up to 18,000 which is the maximum number of rogue clients that can be tracked by a mobility services engine.</li> </ol> <p><b>Note</b> Active Value (Display only): Indicates the number of rogue clients being tracked.</p> <p><b>Note</b> Not Tracked (Display only): Indicates the number of rogue clients beyond the limit.</p>
Interferers	<ol style="list-style-type: none"> <li>1. Select the <b>Enable</b> check box to enable tracking of the interferers by the mobility services engine.</li> <li>2. Select the <b>Enable Limiting</b> check box to set a limit on the number of interferers to track.</li> <li>3. Enter a Limit Value if limiting is enabled.</li> </ol> <p>In Release 7.0, the client license encompasses all network location service elements and is shared among wireless clients, wired clients, rogue clients, access points, and interferers.</p> <p>In Release 7.0.200.x, the client license encompasses all network location service elements and is shared among wireless clients, wired clients, rogue clients, access points, interferers, and guests.</p> <p><b>Note</b> Active Value (Display only): Indicates the number of interferers currently being tracked.</p> <p><b>Note</b> Not Tracked (Display only): Indicates the number of interferers beyond the limit.</p>
Asset Tracking Elements	



**Table 9-1**      **Tracking Parameters (continued)**

Field	Configuration Options
Active RFID Tags	<p>Select the <b>Enable</b> check box to enable tracking of active RFID tags by the mobility services engine.</p> <p><b>Note</b>    The actual number of tracked active RFID tags is determined by the license purchased.</p> <p><b>Note</b>    Active Value (Display only): Indicates the number of active RFID tags currently being tracked.</p> <p><b>Note</b>    Not Tracked (Display only): Indicates the number of active RFID tags beyond the limit.</p>
SNMP Parameters—Not applicable for controllers Release 4.2 and earlier. Also not applicable for MSEs 7.0.105.0 and later release.	
SNMP Retry Count	Enter the number of times to retry a polling cycle. The default value is 3. Allowed values are from 1 to 99999. (Configurable in controller Release 4.1 and earlier and location server Release 3.0 and earlier only.)
SNMP Timeout	Enter the number of seconds before a polling cycle times out. The default value is 5. Allowed values are from 1 to 99999. (Configurable in controller Release 4.1 and earlier and location server Release 3.0 and earlier only.)
SNMP Polling Interval—Not applicable for MSEs Release 7.0.105.0 and later.	
Client Stations	Select the <b>Enable</b> check box to enable client station polling and enter the polling interval in seconds. The default value is 300. Allowed values are from 1 to 99999. (Configurable in controller Release 4.1 and earlier and location server Release 3.0 and earlier only.)
Active RFID Tags	<p>Select the <b>Enable</b> check box to enable active RFID tag polling and enter the polling interval in seconds. Allowed values are from 1 to 99999.</p> <p> <b>Note</b>    Before the mobility service can collect asset tag data from controllers, you must enable the detection of active RFID tags using the <b>config rfid status enable</b> command on the controllers.</p>
Rogue Clients and Access Points	Select the <b>Enable</b> check box to enable rogue access point polling and enter the polling interval in seconds. The default value is 600. Allowed values are from 1 to 99999 (Configurable in controller Release 4.1 and earlier and location server Release 3.0 and earlier only.)
Statistics	Select the <b>Enable</b> check box to enable statistics polling for the mobility service, and enter the polling interval in seconds. The default value is 900. Allowed values are from 1 to 99999 (Configurable in controller Release 4.1 and earlier and location server Release 3.0 and earlier only.)

**Step 5**      Click **Save** to store the new settings in the mobility services engine database.

## Modifying Filtering Parameters

In addition to tracking parameters, you can use filtering to limit the number of clients, asset tags, wired clients, rogue clients, interferers, and access points whose locations are tracked. You can filter by MAC address and probing clients.

- MAC addresses

Specific MAC addresses can be entered and labeled as allowed or disallowed from location tracking. You can import a file with the MAC addresses that are to be allowed or disallowed, or you can enter them individually in the Prime Infrastructure.

The format for entering MAC addresses is xx:xx:xx:xx:xx:xx. If a file of MAC addresses is imported, the file must follow a specific format:

- Each MAC address should be listed on a separate line.
- Allowed MAC addresses must be listed first and preceded by an “[Allowed]” line item. Disallowed MAC addresses must be preceded by “[Disallowed].”
- Wildcard listings can be used to represent a range of MAC addresses. For example, the first entry “00:11:22:33:\*” in the following allowed listing is a wildcard.



### Note

Allowed MAC address formats are viewable in the Filtering Parameters configuration page. See [Table 9-2](#) for details.

EXAMPLE file listing:

```
[Allowed]
00:11:22:33:*
22:cd:34:ae:56:45
02:23:23:34:*
[Disallowed]
00:10:*
ae:bc:de:ea:45:23
```

- Probing clients

Probing clients are clients that are associated with one controller but whose probing activity enables them to appear to another controller and count as an element for the *probed* controller as well as its primary controller.

This section contains the following topics:

- [Guidelines and Limitations, page 9-26](#)
- [Configuring Filtering Parameters for a Mobility Services Engine, page 9-26](#)

## Guidelines and Limitations

Excluding probing clients can free up the licenses for the associated clients.

## Configuring Filtering Parameters for a Mobility Services Engine

To configure filtering parameters for a mobility services engine, follow these steps:

- 
- Step 1** Choose **Services > Mobility Services Engines**. The Mobility Services page appears.

- Step 2** Click the name of the mobility services engine whose properties you want to edit. The General Properties page appears.
- Step 3** Choose **Context Aware Service > Administration > Filtering Parameters** to display the configuration options.
- Step 4** Modify the filtering parameters as appropriate. [Table 9-2](#) lists filtering parameters.

**Table 9-2** *Filtering Parameters*

Field	Configuration Options
Advanced Filtering Params	
Duty Cycle Cutoff Interferers	<p>Enter the duty cycle cutoff value for interferers so that only those interferers whose duty cycle meets the specified limits are tracked and counted against the CAS license.</p> <p>The default value for the Duty Cycle Cutoff Interferers is 0% and the configurable range is from 0% to 100%.</p> <p>In order to better utilize the location license, you can chose to specify a filter for interferers based on the duty cycle of the interferer.</p>
MAC Filtering Params	

**Table 9-2**      **Filtering Parameters (continued)**

Field	Configuration Options
Exclude Probing Clients	Select the check box to prevent calculating location for probing clients.
Enable Location MAC Filtering	<ol style="list-style-type: none"> <li>1. Select the check box to enable filtering of specific elements by their MAC addresses.</li> <li>2. To import a file of MAC addresses (Upload a file for Location MAC Filtering text box), browse for the file name and click <b>Save</b> to load the file. MAC addresses from the list auto-populate the Allowed List and Disallowed List based on their designation in the file.</li> </ol> <p><b>Note</b> To view allowed MAC address formats, click the red question mark next to the Upload a file for Location MAC Filtering text box.</p> <ol style="list-style-type: none"> <li>3. To add an individual MAC address, enter the MAC addresses (format is xx:xx:xx:xx:xx:xx) in the Add a single MAC entry and click either <b>Allow</b> or <b>Disallow</b>. The address appears in the appropriate column.</li> </ol> <p><b>Note</b> To move an address between the Allow and Disallow columns, highlight the MAC address entry and click the button under the appropriate column.</p> <p><b>Note</b> To move multiple addresses, click the first MAC address and then press <b>Ctrl</b> and click additional MAC addresses. Click <b>Allow</b> or <b>Disallow</b> to place an address in that column.</p> <p><b>Note</b> If a MAC address is not listed in the Allow or Disallow column, it appears in the Blocked MACs column by default. If you click the Unblock button, the MAC address automatically moves to the Allow column. You can move it to the Disallow column by clicking the Disallow button under the Allow column.</p>

**Step 5** Click **Save** to store the new settings in the mobility services engine database.

## Modifying History Parameters

You can use the Prime Infrastructure to specify how long to store (archive) histories on client stations, asset tags, and rogue clients, wired clients, interferers and access points.


You can also program the mobility services engine to periodically prune (remove) duplicate data from its historical files, which increases the amount of memory available for storing the latest history information. This is important to prevent losing the latest history information due to lack of disk space.

## Configuring Mobility Services Engine History Settings

To configure mobility services engine history, follow these steps:

- Step 1** Choose **Services > Mobility Services Engines**.
- Step 2** Click the name of the mobility services engine whose properties you want to edit.
- Step 3** Choose **Context Aware Service > Administration > History Parameters**.
- Step 4** Modify the following history parameters as appropriate. [Table 9-3](#) lists history parameter.

**Table 9-3 History Parameters**

Field	Description
Archive for	Enter the number of days for the location server to retain a history of each enabled category. Default value is 30. Allowed values are from 1 to 365.
Prune data starting at	<p>Enter the number of hours and minutes at which the location server starts data pruning (between 0 and 23 hours, and between 1 and 59 minutes).</p> <p>Enter the interval in minutes after which data pruning starts again (between 1 and 99900000). Default start time is 23 hours and 50 minutes, and the default interval is 1440 minutes.</p> <p><b>Note</b> Enter the default limits for better performance.</p>
Client Stations	Select the <b>Enable</b> check box to turn on historical data collection for client stations.
Wired Stations	Select the <b>Enable</b> check box to turn on historical data collection for wired stations.
Asset Tags	<p>Select the <b>Enable</b> check box to turn on historical data collection.</p> <p> <b>Note</b> Before the mobility service can collect asset tag data from controllers, you must enable the detection of RFID tags using the <b>config rfid status enable</b> command.</p>
Rogue Clients and Access Points	Select the <b>Enable</b> check box to turn on historical data collection.
Interferers	Select the <b>Enable</b> check box to turn on historical data collection.

- Step 5** Click **Save** to store your selections in the mobility services engine database.

## Enabling Location Presence

You can enable location presence on a mobility services engine to expand civic (city, state, postal code, country) and geographic (longitude, latitude) location information beyond the Cisco default settings (campus, building, floor, and X, Y coordinates). You can then request this information for wireless and wired clients on demand for use by location-based services and applications.

You can also import advanced location information such as the MAC address of a wired client and the wired switch slot and port to which the wired client is attached.

You can configure location presence when a new campus, building, floor or outdoor area is added or configure it at a later date.

Once enabled, the mobility services engine can provide any requesting Cisco CX v5 client its location.



### Note

Before enabling this feature, synchronize the mobility services engine.

This section contains the following topics:

- [Guidelines and Limitations, page 9-30](#)
- [Enabling and Configuring Location Presence on a Mobility Services Engine, page 9-30](#)

## Guidelines and Limitations

For details on configuring location presence when adding a new campus, building, floor, or outdoor area, see Chapter 6, “Configuring Maps” section of the *Cisco Wireless Control System Configuration Guide*, Release 6.0.

Before enabling location presence, synchronize the mobility services engine.

## Enabling and Configuring Location Presence on a Mobility Services Engine

To enable and configure location presence on a mobility services engine, follow these steps:

- Step 1** Choose **Services > Mobility Services Engines**. Select the mobility services engine to which the campus or building or floor is assigned.
- Step 2** Choose **Context Aware Service > Administration > Presence Parameters**. The Presence page appears.
- Step 3** Select the **Service Type On Demand** check box to enable location presence for Cisco CX clients v5.
- Step 4** Select one of the following Location Resolution options:
  - a. When Building is selected, the mobility services engine can provide any requesting client its location by building.
    - For example, if a client requests its location and the client is located in Building A, the mobility services engine returns the client address as Building A.
  - b. When AP is selected, the mobility services engine can provide any requesting client its location by its associated access point. The MAC address of the access point appears.
    - For example, if a client requests its location and the client is associated with an access point with a MAC address of 3034:00hh:0adg, the mobility services engine returns the client address of 3034:00hh:0adg.

- c. When X,Y is selected, the mobility services engine can provide any requesting client its location by its X and Y coordinates.
  - For example, if a client requests its location and the client is located at (50, 200) the mobility services engine returns the client address of 50, 200.

- Step 5** Select any or all of the location formats check boxes:
- a. Select the **Cisco** check box to provide location by campus, building, floor, and X and Y coordinates. This is the default setting.
  - b. Select the **Civic** check box to provide the name and address (street, city, state, postal code, country) of a campus, building, floor, or outdoor area.
  - c. Select the **GEO** check box to provide the longitude and latitude coordinates.
- Step 6** By default, the Text check box for Location Response Encoding is selected. It indicates the format of the information when received by the client. There is no need to change this setting.
- Step 7** Select the **Retransmission Rule Enable** check box to allow the receiving client to retransmit the received information to another party.
- Step 8** Enter a Retention Expiration value in minutes. This determines how long the received information is stored by the client before it is overwritten. The default value is 24 hours (1440 minutes).
- Step 9** Click **Save**.
- 

## Importing and Exporting Asset Information

This section contains the following topics:

- [Importing Asset Information, page 9-31](#)
- [Exporting Asset Information, page 9-32](#)

### Importing Asset Information

To import asset, chokepoint, and Time Difference Of Arrival (TDOA) receiver information for the mobility services engine using the Prime Infrastructure, follow these steps:

- 
- Step 1** Choose **Services > Mobility Services Engines**.
- Step 2** Click the name of the mobility services engine for which you want to import information.
- Step 3** Choose **Context Aware Service > Administration > Import Asset Information**.
- Step 4** Enter the name of the text file or browse for the filename.  
Specify information in the imported file in the following formats:
- tag format: #tag, 00:00:00:00:00:00, categoryname, groupname, assetname
  - station format: #station, 00:00:00:00:00:00, categoryname, groupname, assetname
- Step 5** Click **Import**.
-

## Exporting Asset Information

To export asset, chokepoint, and Time Difference Of Arrival (TDOA) receiver information from the mobility services engine to a file using Prime Infrastructure, follow these steps:

- 
- Step 1** Choose **Services > Mobility Services Engines**.
- Step 2** Click the name of the mobility services engine from which you want export information.
- Step 3** Choose **Context Aware Service > Administration > Export Asset Information**.  
Information in the exported file is in the following formats:
- tag format: #tag, 00:00:00:00:00:00, categoryname, groupname, assetname
  - station format: #station, 00:00:00:00:00:00, categoryname, groupname, assetname
- Step 4** Click **Export**.
- Step 5** Click **Open** (display to page), **Save** (to external PC or server), or **Cancel**.



**Note** If you click **Save**, you are asked to select the asset file destination and name. The file is named assets.out by default. Click **Close** from the dialog box when download is complete.

---

## Modifying Location Parameters

You can use the Prime Infrastructure to modify parameters that affect location calculations such as Receiver Signal Strength Indicator (RSSI) measurements for clients.

You can also apply varying smoothing rates to manage location movement of a client.

This section contains the following topics:

- [Guidelines and Limitations, page 9-32](#)
- [Configuring Location Parameters, page 9-32](#)

### Guidelines and Limitations

- Location parameters apply only to clients.
- Enable the Calculation time parameter only under Cisco TAC personnel guidance because it slows down the overall location calculations.
- Modify the RSSI Cutoff parameter only under Cisco TAC personnel guidance. Modifying this value can reduce the location calculation accuracy.

### Configuring Location Parameters



To configure location parameters, follow these steps:

- 
- Step 1** Choose **Services > Mobility Services Engines**.
- Step 2** Click the name of the mobility services engine whose properties you want to modify.



- Step 3** Choose **Context Aware Service > Advanced > Location Parameters**. The configuration options appear.
- Step 4** Modify the location parameters as appropriate. [Table 9-4](#) lists location parameters.

**Table 9-4** Location Parameters

Field	Configuration Options
Enable Calculation time	<p>Select the <b>Enable</b> check box to initiate the calculation of the time required to compute location.</p> <p><b>Note</b> This parameter applies only to clients, rogue access points, rogue clients, and interferers.</p> <p> <b>Caution</b> Enable this parameter only under Cisco TAC personnel guidance because it slows down the overall location calculations.</p>
Enable OW Location	<p>Select the <b>Enable</b> check box to include Outer Wall (OW) calculation as part of location calculation.</p> <p><b>Note</b> This parameter is ignored by the mobility services engine.</p>
Relative discard RSSI time	<p>Enter the number of minutes since the most recent RSSI sample after which RSSI measurement should be considered discarded. For example, if you set this parameter to 3 minutes and the mobility services engine receives two samples at 10 and 12 minutes, it keeps both samples. An additional sample received at 15 minutes is discarded. The default value is 3. Allowed values range from 0 to 99999. A value of less than 3 is not recommended.</p> <p><b>Note</b> This parameter applies only to clients, rogue access points, rogue clients, and interferers.</p>
Absolute discard RSSI time	<p>Enter the number of minutes after which RSSI measurement should be considered stale and discarded, regardless of the most recent sample. The default value is 60. Allowed values range from 0 to 99999. A value of less than 60 is not recommended.</p> <p><b>Note</b> This parameter applies only to clients.</p>
RSSI Cutoff	<p>Enter the RSSI cutoff value, in decibels (dBs) with respect to one (1) mW (dBm), above which the mobility services engine will always use the access point measurement. The default value is -75.</p> <p><b>Note</b> When 3 or more measurements are available above the RSSI cutoff value, the mobility services engine discards any weaker values (lower than RSSI cutoff value) and use the 3 (or more) strongest measurements for calculation; however, when only weak measurements below the RSSI cutoff value are available, those values are used for calculation.</p> <p><b>Note</b> This parameter applies only to clients.</p> <p> <b>Caution</b> Modify only under Cisco TAC personnel guidance. Modifying this value can reduce the accuracy of location calculation.</p>
Enable Location Filtering	<p>Location filtering is used to smooth out the jitters in the calculated location. This prevents the located device from jumping between two discrete points on the floor map.</p>

**Table 9-4**      **Location Parameters (continued)**

Field	Configuration Options
Chokepoint Usage	Select the <b>Enable</b> check box to enable chokepoints to track Cisco compatible tags.
Use Chokepoints for Interfloor conflicts	Perimeter chokepoints or weighted location readings can be used to locate Cisco compatible tags. Options: <ul style="list-style-type: none"> <li>• Never: When selected, perimeter chokepoints are not used to locate Cisco compatible tags.</li> <li>• Always: When selected, perimeter points are used to locate Cisco compatible tags.</li> <li>• Floor Ambiguity: When selected, both weighted location readings and perimeter chokepoints are used to locate Cisco-compatible tags. If similar locations are calculated by the two methods, the perimeter chokepoint value is used by default.</li> </ul>
Chokepoint Out of Range timeout	When a Cisco compatible tag leaves a chokepoint range, the timeout period entered is the period that passes before RSSI values are again used for determining location.
Absent Data cleanup interval	Enter the number of minutes that data for <i>absent</i> mobile stations is kept. An <i>absent</i> mobile station is one that was discovered but does not appear in the network. Default value is 1440.
Use Default Heatmaps for Non Cisco Antennas	Select this check box to enable the usage of default heatmaps for non-Cisco antennas during the Location Calculation. This option is disabled by default.
<b>Movement Detection</b>	
Individual RSSI change threshold	This parameter specifies the Individual RSSI movement recalculation trigger threshold. Enter a threshold value between 0-127 dBm. Modify only under Cisco TAC personnel guidance.
Aggregated RSSI change threshold	This parameter specifies the Aggregated RSSI movement recalculation trigger threshold. Enter a threshold value between 0-127 dBm. Modify only under Cisco TAC personnel guidance.
Many new RSSI change percentage threshold	This parameter specifies Many new RSSI movement recalculation trigger threshold in percentage. Modify only under Cisco TAC personnel guidance.
Many missing RSSI percentage threshold	This parameter specifies Many many RSSI movement recalculation trigger threshold in percentage. Modify only under Cisco TAC personnel guidance.

**Step 5**      Click **Save**.

# Enabling Notifications and Configuring Notification Parameters

You can use the Prime Infrastructure to enable notifications and configure notification parameters.

This section contains the following topics:

- [Guidelines and Limitations, page 9-35](#)
- [Enabling Notifications, page 9-35](#)
- [Configuring Notification Parameters, page 9-35](#)
- [Viewing Notification Statistics, page 9-37](#)

## Guidelines and Limitations

Modify notification parameters only when you expect the mobility services engine to send a large number of notifications or when notifications are not being received.

## Enabling Notifications

You can use Prime Infrastructure to define and enable user-configured conditional notifications and northbound notifications.

User-configured conditional notifications manage which notifications the mobility services engine sends to the Prime Infrastructure or a third-party destination compatible with the mobility services engine notifications. See the [“Adding, Deleting, and Testing Event Definitions” section on page 8-8](#).

Northbound notifications define which tag notifications the mobility services engine sends to third-party applications. Client notifications are not forwarded. By enabling northbound notifications in the Prime Infrastructure, the following five event notifications are sent: chokepoints, telemetry, emergency, battery, and vendor data. To send a tag location, you must enable that notification separately.

The mobility services engine sends all northbound notifications in a set format. Details are available on the Cisco developers support portal at the following URL:

<http://developer.cisco.com/web/cdc>

## Configuring Notification Parameters

You can limit the rate at which a mobility services engine generates notifications, set a maximum queue size for notifications, and set a retry limit for notifications with in a certain period.

Notification parameter settings apply to user-configurable conditional notifications and northbound notifications except as noted in [Table 9-5](#).



### Note

Modify notification parameters only when you expect the mobility services engine to send a large number of notifications or when notifications are not being received.

To enable northbound notifications and to configure notification parameters, follow these steps:

**Step 1** Choose **Services > Mobility Services Engines**.

- Step 2** Click the name of the mobility services engine you want to configure.
- Step 3** Choose **Context Aware Service > Advanced > Notification Parameters** to display the configuration options.
- Step 4** Select the **Enable Northbound Notifications** check box to enable the function.
- Step 5** Select the **Notification Contents** check box to send notifications to third-party applications (northbound).
- Step 6** Select one or more of the following Notification Contents check boxes:
- **Chokepoints**
  - **Telemetry**
  - **Emergency**
  - **Battery Level**
  - **Vendor Data**
  - **Location**
- Step 7** Select the **Notification Triggers** check box.
- Step 8** Select one or more of the following Notification Triggers check boxes:
- **Chokepoints**
  - **Telemetry**
  - **Emergency**
  - **Battery Level**
  - **Vendor Data**
  - **Location Recalculation**
- Step 9** Enter the IP address or hostname and port for the system that is to receive the northbound notifications.
- Step 10** Choose the transport type from the drop-down list.
- Step 11** Select the **HTTPS** check box if you want to use HTTPS protocol for secure access to the destination system.
- Step 12** To modify the notification parameter settings, enter the new value in the appropriate text box in the Advanced tab of this page. See [Table 9-5](#).

**Table 9-5** *User-Configurable Conditional and Northbound Notifications Fields*

Field	Configuration Options
Rate Limit	Enter the rate, in milliseconds, at which the mobility services engine generates notifications. A value of 0 (default) means that the mobility services engine generates notifications as fast as possible (Northbound notifications only).
Queue Limit	Enter the event queue limit for sending notifications. The mobility services engine drops any event above this limit. Default values: Cisco 3350 (30000), Cisco 3315 (5,000), and Cisco 2710 (10,000).
Retry Count	Enter the number of times to generate an event notification before the refresh time expires. This parameter can be used for asynchronous transport types which do not acknowledge the receipt of the notification and there is a possibility that the notification may be lost in transit. Default value is 1.
<b>Note</b> The mobility services engine does not store events in its database.	

**Table 9-5** *User-Configurable Conditional and Northbound Notifications Fields (continued)*

Field	Configuration Options
Refresh Time	Enter the wait time in minutes that must pass before a notification is resent. For example, if a device is configured for In Coverage Area notification and it is constantly being detected within the Coverage Area. The notification is sent once every refresh time. Default value is 0 minutes.
Drop Oldest Entry on Queue Overflow	(Read-only). The number of event notifications dropped from the queue since startup.
Serialize Events per Mac address per Destination	Select this option if you want the successive events for the same MAC address to be sent to a single destination in a serial manner.

**Step 13** Click **Save**.

## Viewing Notification Statistics

You can view the notification statistics for a specific mobility engine. To view notification statistics information for a specific mobility services engine, follow these steps:

**Step 1** Choose **Services > Mobility Services Engines**.

**Step 2** Click the name of the mobility services engine you want to configure.

**Step 3** Choose **Context Aware Service > Advanced > Notification Parameters** to display the configuration options.

You can view the notification statistics for a specific mobility services engine. To view the Notification parameters, choose **Services > Mobility Services Engines > MSE-name > Context Aware Service > Notification Statistics**.

where *MSE-name* is the name of a mobility services engine.

[Table 9-6](#) describes the fields in the Notification Statistics page.

**Table 9-6** *Notification Statistics Page Fields*

Field	Description
<b>Summary</b>	
Destinations	
Total	Destination total count.
Unreachable	Unreachable destination count.
<b>Notification Statistics Summary</b>	
Track Definition Status	Status of the track definition. Track notification status can be either Enabled or Disabled.
Track Definition	Track definition can be either Northbound or CAS event notification.

**Table 9-6 Notification Statistics Page Fields (continued)**

Field	Description
<b>Summary</b>	
Destination IP Address	The destination IP address to which the notifications are sent.
Destination Port	The destination port to which the notifications are sent.
Destination Type	The type of the destination. Example: SOAP_XML.
Destination Status	Status of the destination device. The status is either Up or Down.
Last Sent	The date and time at which the last notification was sent to the destination device.
Last Failed	The date and time at which the notification had failed.
Total Count	The total count of notifications sent to the destination. Click the count link to view the notification statistics details of the destination device.

## Location Template for Controllers

You can define a location template for the controller that you can download to multiple controllers.

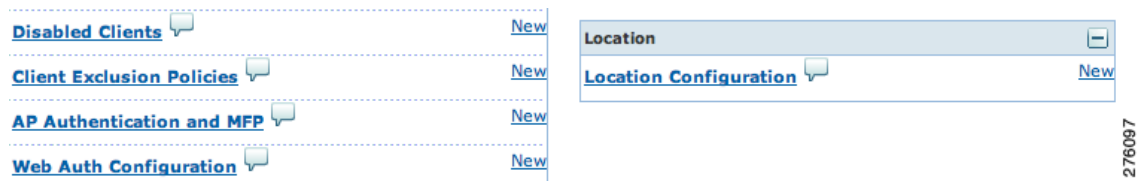
You can set the following general and advanced parameters on the location template.

- General parameters—Enable RFID tag collection, set the location path loss for calibrating or normal (non-calibrating) clients, measurement notification for clients, tags, and rogue access points, set the RSSI expiry timeout value for clients, tags, and rogue access points.
- Advanced parameters—Set the RFID tag data timeout value and enable the location path loss configuration for calibrating client multi-band.

## Configuring a New Location Template for a Controller

To configure a new location template for a controller, follow these steps:

- 
- Step 1** Choose **Configure > Controller Template Launch Pad**.
- Step 2** Select the **New** (Location Configuration) link under the Location heading to create a new location template (see [Figure 9-2](#)).

**Figure 9-2** *Configure > Controller Template Launch Pad Page*

**Step 3** In the New Controller Template page, enter a name for the location template on the General tab.

**Step 4** On the General tab, modify parameters as necessary. [Table 9-7](#) lists each of the fields.

**Table 9-7** *General Tab Fields*

Parameter	Configuration Options
RFID Tag Data Collection	Select the <b>Enabled</b> check box to collect data on tags.
Location Path Loss Configuration	
Calibrating Client	Select the <b>Enabled</b> check box to have a calibrating client. Controllers send regular S36 or S60 requests (depending on the client capability) by way of the access point to calibrating clients. Packets are transmitted on all channels. All access points irrespective of channel (and without a channel change) gather RSSI data from the client at each location. These additional transmissions and channel changes might degrade contemporaneous voice or video traffic.  To use all radios (802.11a/b/g/n) available, you must enable multiband in the Advanced tab.
Normal Client	Select the <b>Enabled</b> check box to have a non-calibrating client. No S36 or S60 requests are transmitted to the client.
Measurement Notification Interval	
Tags, Clients and Rogue APs/Clients	Enter a value to set the Network Mobility Services Protocol (NMSP) measurement notification interval for clients, tags, and rogue access points and clients. This value can be applied to selected controllers through the template. Setting this value on the controller generates out-of-sync notification which you can view in the Services > Synchronize Services page. When a controller and the mobility services engine have two different measurement intervals, the largest interval setting of the two is adopted by the mobility services engine.  Once this controller is synchronized with the mobility services engine, the new value is set on the mobility services engine.
RSSI Expiry Timeout	
RSSI Expiry Timeout for Clients	Enter a value to set the RSSI timeout value for normal (non-calibrating) clients.
RSSI Expiry Timeout for Calibrating Clients	Enter a value to set the RSSI timeout value for calibrating clients.

**Table 9-7**      **General Tab Fields (continued)**

Parameter	Configuration Options
RSSI Expiry Timeout for Tags	Enter a value to set the RSSI timeout value for tags.
RSSI Expiry Timeout for Rogue APs	Enter a value to set the RSSI timeout value for rogue access points.

**Step 5**      On the Advanced tab, modify parameters as necessary.

[Table 9-8](#) describes each of the Advanced tab fields.

**Table 9-8**      **Advanced Location Fields**

Field	Configuration Options
RFID Tag Data Timeout	Enter an RFID tag data timeout value.
Location Path Loss Configuration	
Calibrating Client Multiband	Select the <b>Enabled</b> check box to send S36 and S60 packets (where applicable) on all channels. Calibrating clients must be enabled on the General tab.

**Step 6**      Click **Save**.

## Location Services on Wired Switches and Wired Clients

You can import the location of wired Catalyst stackable switches (2960, IE-3000, 3560, 3750, 3750-E, switches), switch blades (3020, 3030, 3040, 3110, 3120, 3130), and switch ports into the mobility services engine.

Once you define a wired switch and synchronize it with a mobility services engine, details on wired clients connected to a wired switch are downloaded to the mobility services engine over the NMSP connection. You can then view wired switches and wired clients using the Prime Infrastructure.

Import and display of civic and emergency location identification number (ELIN) meets specifications of RFC 4776, which is outlined at the following URL: <http://tools.ietf.org/html/rfc4776#section-3.4>

This section contains the following topics:

- [Prerequisites to Support Location Services for Wired Clients, page 9-41](#)
- [Guidelines and Limitations, page 9-41](#)
- [Configuring a Catalyst Switch Using the CLI, page 9-41](#)
- [Adding a Catalyst Switch to the Prime Infrastructure, page 9-43](#)
- [Assigning and Synchronizing a Catalyst Switch to a Mobility Services Engine, page 9-43](#)



## Prerequisites to Support Location Services for Wired Clients

To support location services for wired clients and wired Catalyst switches, you must do the following:

- Configure the Catalyst switch.
- Add the Catalyst switch to the Prime Infrastructure.
- Catalyst stackable switches and switch blades must be running Cisco IOS Release 12.2(52) SG or later.
- Assign the Catalyst switch to the mobility services engine and synchronize.

## Guidelines and Limitations

The following Catalyst 4000 series switches are also supported:

- WS-C4948, WS-C4948-10GE, ME-4924-10GE, WS-4928-10GE, WS-C4900M, WS-X4515, WS-X4516, WS-X4013+, WS-X4013+TS, WS-X4516-10GE, WS-X4013+10GE, WS-X45-SUP6-E, and WS-X45-SUP6-LE
- A switch can be synchronized only with one mobility services engine. However, a mobility services engine can have many switches connected to it.

## Configuring a Catalyst Switch Using the CLI

To configure location services on a wired switch or wired client, and apply it to an interface, follow these steps:



**Note** All commands are located in the privileged EXEC mode of the command-line interface.

- 
- Step 1** Log in to the command-line interface of the switch:
- ```
Switch > en
Switch#
Switch# Configure terminal
```
- Step 2** Enable NMSP:
- ```
Switch(Config)# nmosp
Switch(config-nmsp)# enable
```
- Step 3** Configure the SNMP community:
- ```
Switch(config)# snmp-server community wired-location
```
- Step 4** Enable IP device tracking in the switch:
- ```
Switch(config)# ip device tracking
```
- Step 5** (Optional) Configure a civic location for a switch.

**Note**

You can define a civic and emergency location identification number (ELIN) for a specific location. That identifier can then be assigned to a switch or multiple ports on a switch to represent that location. This location identifier is represented by a single number such as 6 (range 1 to 4095). This saves time when you are configuring multiple switches or ports that reside in the same location.

Enter configuration commands, one per line. End by pressing **Ctrl-Z**.

The following is an example of a civic location configuration:

```
Switch(config)# location civic-location identifier 6
Switch(config-civic)# name "switch-loc4"
Switch(config-civic)# seat "ws-3"
Switch(config-civic)# additional code "1e3f0034c092"
Switch(config-civic)# building "SJ-14"
Switch(config-civic)# floor "4"
Switch(config-civic)# street-group "Cisco Way"
Switch(config-civic)# number "3625"
Switch(config-civic)# type-of-place "Lab"
Switch(config-civic)# postal-community-name "Cisco Systems, Inc."
Switch(config-civic)# postal-code "95134"
Switch(config-civic)# city "San Jose"
Switch(config-civic)# state "CA"
Switch(config-civic)# country "US"
Switch(config-civic)# end
```

**Step 6** Configure the ELIN location for the switch.**Note**

The ELIN location length must be between 10 and 25 characters. In the following example, 4084084000 meets that specification. This number can also be entered as 408-408-4000. Additionally, a value with a mix of numerals and text can be entered such as 800-CISCO-WAY or 800CISCOWAY. However, if you place spaces between the numerals or text without hyphens, quotes should be used, such as "800 CISCO WAY."

```
Switch(config)# location elin-location "4084084000" identifier 6
Switch(config)# end
```

**Step 7** Configure the location for a port on the switch.

A switch has a specified number of switch ports, and clients and hosts are connected at these ports. When configuring location for a specific switch port, the client connected at that port is assumed to have the port location.

If a switch (switch2) is connected to a port (such as port1) on another switch (switch1) all the clients connected to switch2 are assigned the location that is configured on port1.

The syntax for defining the port is: **interface {GigabitEthernet | FastEthernet} slot/module/port**

Enter only one location definition on a line, and end the line by pressing **Ctrl-Z**.

```
Switch(config)# interface GigabitEthernet 1/0/10
Switch(config-if)# location civic-location-id 6
Switch(config-if)# location elin-location-id 6
Switch(config-if)# end
```

**Step 8** Assign a location to the switch itself.

The following port location is configured on the FastEthernet network management port of the switch.

Enter configuration commands, one per line. End by pressing **Ctrl-Z**.

```
Switch(config)# interface FastEthernet 0
Switch(config-if)# location civic-location-id 6
Switch(config-if)# location elin-location-id 6
Switch(config-if)# end
```

---

## Adding a Catalyst Switch to the Prime Infrastructure

All Catalyst switches must be configured with location service before they are added to the Prime Infrastructure. See the [“Configuring a Catalyst Switch Using the CLI”](#) section on page 9-41 for more information.

To add a Catalyst switch configured for wired location service to Prime Infrastructure, follow these steps:

- 
- Step 1** Choose **Configure > Switches**.
- Step 2** From the Select a command drop-down list, choose **Add Switches**. The Add Switches page appears.
- Step 3** Choose **Device Info** or **File** from the Add Format Type drop-down list.



**Note** Choose **Device Info** to manually enter one or more switch IP addresses. Choose **File** to import a file with multiple Catalyst switch IP addresses defined. When File is selected, a dialog box appears that defines the accepted format for the imported file.

---

- Step 4** Enter one or more IP addresses.
- Step 5** From the License Level drop-down list, choose the level of license.
- Step 6** From the Version drop-down list, choose the SNMP version if it is different from the default.
- Step 7** No changes are required in the Retries and SNMP Timeout text boxes.
- Step 8** Enter wired-location as the SNMP community string in the Community text box.



**Note** The SNMP community string entered at this step must match that value assigned to the Catalyst switch in [Step 3](#) of the [“Configuring a Catalyst Switch Using the CLI”](#) section on page 9-41.

---

- Step 9** Click **Add**. A page confirming the successful addition to the Prime Infrastructure appears.
- Step 10** Click **OK** in the Add Switches Result page. The newly added switch appears in the Ethernet Switches page.
- 

## Assigning and Synchronizing a Catalyst Switch to a Mobility Services Engine

After adding a Catalyst switch to the Prime Infrastructure, you need to assign it to a mobility services engine and then synchronize the two systems. Once they are synchronized, an NMSP connection between the controller and the mobility services engine is established.

All information on wired switches and wired clients connected to those switches downloads to the mobility services engine.



**Note** A switch can be synchronized only with one mobility services engine. However, a mobility services engine can have many switches connected to it.

To assign and synchronize Catalyst switches to a mobility services engine, follow these steps:

- 
- Step 1** Choose **Services > Synchronize Services**.
  - Step 2** Click the **Wired Switches** tab to assign a switch to a mobility services engine.
  - Step 3** Choose one or more switches to be synchronized with the mobility services engine.
  - Step 4** Click **Change MSE Assignment**.
  - Step 5** Choose the mobility services engine to which the switches are to be synchronized.
  - Step 6** Click **Synchronize** to update the mobility services engine(s) database(s).  
When items are synchronized, a green two-arrow icon appears in the Sync. Status column for each synchronized entry.
  - Step 7** To verify the NMSP connection between the switch and a mobility services engine, see the [“Verifying an NMSP Connection to a Mobility Services Engine” section on page 9-44](#).



**Note** See [Chapter 11, “Monitoring the System and Services”](#) for information on monitoring wired switches.

---

## Verifying an NMSP Connection to a Mobility Services Engine

NMSP manages communication between the mobility services engine and a controller or a location-capable Catalyst switch. Transport of telemetry, emergency, and chokepoint information between the mobility services engine and the controller or location-capable Catalyst switch is managed by this protocol.

To verify an NMSP connection between a mobility services engine and a controller or a location-capable Catalyst switch, follow these steps:

- 
- Step 1** Choose **Services > Mobility Services Engines**.
  - Step 2** In the Mobility Services page, click the device name link of the appropriate Catalyst switch or controller.
  - Step 3** Choose **System > Status > NMSP Connection Status**.
  - Step 4** Verify that the NMSP Status is ACTIVE.  
If not active, resynchronize the Catalyst switch or controller and the mobility services engine.

**Note**

On a Catalyst wired switch, enter the **show nmsp status** command to verify NMSP connection.

