CHAPTER 16

NCS Services

This chapter contains the following sections:

Mobility Services

This section briefly describes the CAS, wIPS, and MSAP services that Cisco NCS supports and provides steps for mobility procedures that are common across all services.

CAS

Context-Aware Service (CAS) software allows a mobility services engine to simultaneously track thousands of mobile assets and clients by retrieving contextual information such as location, temperature, and availability from Cisco access points.

Note You must purchase licenses from Cisco to retrieve contextual information on tags and clients from access points. Licenses for tags and clients are offered independently. See the *Cisco 3350 Mobility Services Engine Release Note* at the following URL for details on tag and client licenses:

http://www.cisco.com/en/US/products/ps9742/tsd_products_support_series_home.html

wIPS

Cisco Adaptive Wireless IPS (wIPS) is an advanced approach to wireless threat detection and performance management. Cisco Adaptive wIPS combines network traffic analysis, network device and topology information, signature-based techniques and anomaly detection to deliver highly accurate and complete wireless threat prevention.

Note wIPS functionality is not supported for non-root partition users.

MSAP

Cisco Mobility Services Advertisement Protocol (MSAP)—The Cisco Mobility Services Advertisement Protocol (MSAP) provides functionality to deliver advertisements over Wi-Fi infrastructure. MSAP facilitates MSAP capable mobile devices to receive service advertisements. Once the mobile device receives the service advertisements, it can display their icons and data on its user interface, facilitating the process of users discovering what is available in their surroundings. In addition, MSAP can be used by the mobile devices that have been configured with a set of policies for establishing network connectivity. The MSAP provides requirements for clients and servers and describes the message exchanges between them.

This section contains the following topics:

Cisco Context-Aware Mobility Solution

The foundation of the CAM solution is the controller-based architecture of the CUWN. The CUWN contains the following primary components:

Cisco Prime NCS

With the NCS, network administrators have a single solution for RF prediction, policy provisioning, network optimization, troubleshooting, user tracking, security monitoring, and wired and wireless LAN systems management. Robust graphical interfaces make wired and wireless LAN deployment and operations simple and cost-effective. Detailed trending and analysis reports make NCS vital to ongoing network operations.

WLAN Controllers

The WLAN controllers are highly scalable and flexible platforms that enables system wide services for mission-critical wireless in medium to large-sized enterprises and campus environments. Designed for 802.11n performance and maximum scalability, the WLAN controllers offer enhanced uptime with the ability to simultaneously manage from 5000 access points to 250 access points; superior performance for reliable streaming video and toll quality voice; and improved fault recovery for a consistent mobility experience in the most demanding environments.

NCS supports the Cisco wireless controllers that help reduce the overall operational expense of Cisco Unified Networks by simplifying network deployment, operations, and management. The following WLAN controllers are supported in NCS:

- Cisco 2700 Series Location Appliance
- Cisco 2000 Series Wireless LAN Controllers
- Cisco 2100 Series Wireless LAN Controllers
- Cisco 2500 Series Wireless Controllers
- Cisco 4400 Series Wireless LAN Controllers
- Cisco 5500 Series Wireless Controllers
- Catalyst 3750G Wireless LAN Controller Switches
- Cisco Wireless Services Modules (WiSMs) for Cisco Catalyst 6500 Series Switches
- Cisco Wireless Services Module 2 (WiSM2) for Cisco Catalyst 6500 Series Switches
- Cisco Wireless Controller on SRE for ISR G2 Routers
- Cisco Flex 7500 Series Wireless Controllers
- Cisco WLAN Controller Network Modules for Cisco Integrated Services Routers

Access Points

The following access points are supported:

- Cisco Aironet 801, 802, 1000, 1040, 1100, 1130, 1140, 1200, 1230, 1240, 1250, 1260, 1310, 1500, 1524, 1552, 2600i, 2600e, 3500i, 3500e, 3500p, 3600i, and 3600e Series Lightweight Access Points.
- Cisco Aironet 1040, 1100, 1130, 1141, 1142, 1200, 1240, 1250, and 1260 Autonomous Access Points.

- Cisco 600 Series OfficeExtend Access Points.
- Cisco Aironet Access Points running Lightweight Access Point Protocol (LWAPP) or Control and Provisioning of Wireless Access Points (CAPWAP) protocol.

Cisco 3300 Series Mobility Services Engines

The Cisco 3300 Series Mobility Services Engine operates with CAS, which is a component of the CAM solution. There are three models of the mobility services engine:

- Cisco 33110 Mobility Services Engine
- Cisco 3350 Mobility Services Engine
- Cisco 3355 Mobility Services Engine
- Planning for and Configuring Context-Aware Software, page 16-95
- wIPS Planning and Configuring, page 16-97

Accessing Services

You can access the MSE installation guides as follows:

MSE 3350 Installation guide:

http://www.cisco.com/en/US/docs/wireless/mse/3350/quick/guide/mse_qsg.html

MSE 3310 Installation guide:

http://www.cisco.com/en/US/docs/wireless/mse/3310/quick/guide/MSE3310_GSG.html

MSE Services Co-Existence

With MSE 6.0 and later, you can enable multiple services (Context Aware and wIPS) to run concurrently. Before Version 6.0, mobility services engines only supported one active service at a time.

The following must be considered with co-existence of multiple services:

- Co-existence of services might be impacted by license enforcement. As long as the license is not expired, you can enable multiple services.

  Note Limits for individual services differ. For example, a low-end mobility services engine (MSE-3310) tracks a total of 2,000 CAS elements; a high-end mobility services engine (MSE-3350) tracks a total of 18,000 CAS elements.
  A low-end mobility services engine has a maximum limit of 2000 wIPS elements; a high-end mobility services engine has a maximum limit of 3000 wIPS elements.

- Expired evaluation licenses prevent the service from coming up.
- If a CAS license is added or removed, this process restarts all services on the mobility services engine including wIPS. If a wIPS license is added or removed, the process does not impact CAS; only wIPS restarts.
- Other services can be enabled in evaluation mode even if a permanent license for the maximum number of elements has been applied.

Whenever one of the services has been enabled to run with its maximum license, another service cannot be enabled to run concurrently because the capacity of the MSE is not sufficient to support both services concurrently. For example, on MSE-3310, if you install a wIPS license of 2000, then you cannot enable CAS to run concurrently. However, evaluation licenses are not subject to this limitation.

Note See the "Mobility Services Engine (MSE) License Information" section on page 15-136 for more information on mobility services engine licensing.

Viewing Current Mobility Services

To see a list of current Mobility Services, choose **Services > Mobility Services Engines**.

The Mobility Services Engines page provides the following information and features for each device:

- Device Name—User-assigned name for the mobility services engine. Click the device name to see and manage mobility services engine details. See the "Managing System Properties for a Mobility Services Engine" section on page 16-27" for more information.
- Device Type—Indicates the type of mobility services engine (for example, Cisco 3310 Mobility Services Engine). Indicates whether the device is a virtual appliance or not.
- IP Address—Indicates the IP address for the mobility services engine.
- Version—Indicates the version number of the mobility services engine.
- Reachability Status—Indicates whether or not the mobility services engine is reachable.
- Secondary Server—Indicates whether or not the secondary server is installed.
- Mobility Service:
  - Name—Indicates the name of the mobility service.
  - Admin Status—Indicates whether the mobility service is enabled or disabled.
  - Service Status—Indicates whether the mobility service is currently up or down.
- Select a command drop-down list:
  - Add Location Server
  - Add Mobility Services Engine—Contains Context-Aware Service and Cisco Adaptive Wireless IPS (wIPS) service.
  - Delete Service(s)
  - Synchronize Service
  - Synchronization History
  - Edit Configuration

Note Location and mobility services engine features of NCS do not support partitioning.

Adding a Mobility Services Engine

You can add MSE using the Add Mobility Services Engine dialog box in the Mobility Service page. In this dialog box, you can add licensing files, tracking parameters, and assign maps to MSE. If you launch the wizard with an existing MSE for configuration, then the Add MSE option appears as Edit MSE Details.

Tip To learn more about Cisco Adaptive wIPS features and functionality, go to Cisco.com to watch a multimedia presentation. Here you can find the learning modules for a variety of NCS topics. Over future releases, we will add more overview and technical presentations to enhance your learning.

Note The 1.0 release of NCS recognizes and supports MSE 3355 appropriately.

To add a Cisco 3300 series mobility services engine to NCS, follow these steps:

Step 1 Verify that you can ping the mobility service engine that you want to add from NCS.

Step 2 Choose **Services > Mobility Services Engines** to display the Mobility Services page.

Step 3 From the Select a command drop-down list, choose **Add Mobility Services Engine**, and click **Go**.

The Add Mobility Services Engine page appears.

Step 4 Enter the following information:

- Device Name—User-assigned name for the mobility services engine.
- IP Address—The IP address of the mobility service engine.

Note A mobility services engine is added only if a valid IP address is entered. The Device Name helps you distinguish between devices if you have multiple NCSs with multiple mobility services engines, but it is not considered when validating a mobility services engine.

- Contact Name (optional)—The mobility service engine administrator.
- Username—The default username is admin. This is the NCS communication username configured for MSE.
- Password—The default password is admin.This is the NCS communication password configured for MSE.

Note If you changed the username and password during the automatic installation script, enter those values here. If you did not change the default passwords, we recommend that you rerun the automatic installation script and change the username and password.

- HTTP—When enabled, HTTP is used for communication between the NCS and mobility services engine. By default, NCS uses HTTPS to communicate with MSE.

Note For HTTP communication with a mobility services engine, HTTP must be enabled explicitly on the mobility services engine.

- Select the **Delete synchronized service assignments** check box if you want to permanently remove all service assignments from the mobility services engine.

  This option is applicable for network designs, wired switches, controllers, and event definitions. The existing location history data is retained, however you must use manual service assignments to perform any future location calculations.

Step 5 Click **Next**. The NCS automatically synchronizes the selected elements with the MSE.

After the synchronization, the MSE License Summary page appears. You can use the MSE License Summary page to install a license, add a license, remove a license, install an activation license, and install service license.

Configuring MSE Tracking and History Parameters

Step 6 After you enable services on the mobility services engine, the Select Tracking & History Parameters page appears.

Note If you skip configuring the tracking parameters, the default values are selected.

Step 7 You can select the clients that you want to keep track of by selecting the corresponding Tracking check box(es). The various tracking parameters are as follows:

- Wired Clients
- Wireless Clients
- Rogue Access Points
  - Exclude Adhoc Rogue APs
- Rogue Clients
- Interferers
- Active RFID Tags

Step 8 You can enable the history tracking of devices by selecting the corresponding devices check box(es). The different history parameters are as follows:

- Wired Stations
- Client Stations
- Rogue Access Points
- Rogue Clients
- Interferers
- Asset Tags

Step 9 Click Next to Assign Maps to the MSE.

Assigning Maps to the MSE

Note The Assigning Maps page is available only if you select CAS as one of the services to be enabled on the MSE.

Step 10 Once you configure MSE tracking and history parameters, the Assigning Maps page appears.

The Assign Maps page shows the following information:

- Map Name
- Type (building, floor, campus)
- Status

Step 11 You can see the required map type by selecting either All, Campus, Building, Floor Area, or Outdoor Area from the Filter option available on the page.

Step 12 To synchronize a map, select the **Name** check box and click **Synchronize**.

Upon synchronization of the network designs, the appropriate controllers that have APs assigned on a particular network design are synchronized with the MSE automatically.

Step 13 Click **Done** to save the MSE settings.

Deleting an MSE License File

To delete an MSE license file, follow these steps:

Step 1 Choose **Services > Mobility Service Engine**.

The Mobility Services page appears.

Step 2 Click **Device Name** to delete a license file for a particular service.

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

The Edit Mobility Services Engine dialog box appears.

Step 4 Click **Next** in the Edit Mobility Services Engine dialog box.

The MSE License Summary page appears.

Step 5 Choose the MSE license file that you want to delete in the MSE License Summary page.

Step 6 Click **Remove License**.

Step 7 Click **OK** to confirm the deletion or **Cancel** to close this page without deleting the license.

Step 8 Click **Next** to enable services on the mobility services engine.

Deleting a Mobility Services Engine from Cisco NCS

To delete a mobility services engine from the NCS database, follow these steps:

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

The Mobility Services page appears.

Step 2 Select the mobility services engine(s) to be deleted by selecting the corresponding **Device Name** check box(es).

Step 3 From the Select a command drop-down list, choose **Delete Service(s)**.

Step 4 Click **Go**.

Step 5 Click **OK** to confirm that you want to delete the selected mobility services engine from the NCS database.

Step 6 Click **Cancel** to stop the deletion.

Registering Product Authorization Keys

You receive a product authorization key (PAK) when you order a CAS element, wIPS, or tag license from Cisco. You must register the PAK to receive the license file for installation on the mobility services engine. License files are e-mailed to you after successfully registering a PAK.

CAS element and wIPS PAKs are registered with Cisco.

Tag PAKs are registered with AeroScout.

Note If you do not have a PAK, you can use the sales order number to retrieve the PAK. See the "Retrieving a PAK" section on page 16-10 for more information.

To register for a Product Authorization Key (PAK) and to obtain a license file for install, follow these steps:

Step 1 Open a browser page and enter http://www.cisco.com/web/go/license/index.html.

Step 2 Enter the PAK, and click **SUBMIT**.

Step 3 Verify the license purchase. Click **Continue** if correct. The licensee entry page appears.

Note If the license is incorrect, click the **TAC Service Request Tool** URL to report the problem.

Step 4 In the Designate Licensee page, enter the UDI of the mobility services engine in the host ID text box. This is the mobility services engine on which the license is installed.

Note UDI information for a mobility services engine is found in the General Properties dashlet at **Services** > **Mobility Services Engine** > *Device Name* > *System*.

Step 5 Select the **Agreement** check box. Registrant information appears beneath the Agreement check box.

Modify information as necessary.

Note Ensure that the phone number does not include any characters in the string for the registrant and end user. For example, enter 408 555 1212 rather than 408.555.1212 or 408-555-1212.

Step 6 If the registrant and end user are not the same person, select the **Licensee (End-User)** check box beneath registrant information and enter the end user information.

Step 7 Click **Continue**. A summary of entered data appears.

Step 8 In the Finish and Submit page, review registrant and end-user data. Click **Edit Details** to correct any information, if necessary.

Step 9 Click **Submit**. A confirmation page appears.

Retrieving a PAK

If you do not have a PAK, you can use the sales order number to retrieve the PAK:

Step 1 Go to the Sales Order Status Tool at the following URL: http://tools.cisco.com/qtc/status/tool/action/LoadOrderQueryScreen.

Step 2 After logging in, choose **Sales Order (SO)** from the Type of Query drop-down list.

Step 3 Enter the sales order number in the Value text box.

Note The Date Submitted fields are not required for this inquiry.

Step 4 Select the **Show Serial Number** check box.

Step 5 Select the **Orders** radio button, if not already selected.

Step 6 Choose **Screen** from the Deliver through drop-down list.

Step 7 Click **Search**. Detailed information on the mobility services engine order appears.

Step 8 Click **Line 1. 1** in the table.

Step 9 In Product column (second line), copy the PAK number (starts with 3201J) that you want to register to obtain the license.

Installing Device and wIPS License Files

You can install device and wIPS licenses from NCS.

Note Tag licenses are installed using the AeroScout System Manager. To register your tag PAK, go to this URL:
http://www.aeroscout.com/content/support

To add a client or wIPS license to NCS after registering the PAK, follow these steps:

Step 1 Choose **Administration > Licensing**.

Step 2 Choose **Files > MSE Files** (left pane).

Step 3 Click **Add**. A pop-up dialog box appears.

Step 4 Select **MSE Name**.

Note Verify that the UDI of the selected mobility services engine matches the one you entered when registering the PAK.

Step 5 Click **Choose File** to browse and to select the license file.

Step 6 Click **Upload**. The newly added license appears in the mobility services engine license file list.

Adding a Location Server

To add a location server, follow these steps:

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

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

Step 3 Click **Go**.

Step 4 Enter the following information:

- Device Name
- IP Address
- Contact Name
- User Name
- Password
- Port
- HTTPS—When enabled, HTTPS is used for communication between the NCS and location server.

Step 5 Select the **Delete synchronized service assignments** check box if you want to permanently remove all service assignments from the mobility services engine.

This option is applicable for network designs, wired switches, controllers, and event definitions. The existing location history data is retained, however, you must use manual service assignments to perform any future location calculations.

Step 6 Click **Save**.

Note After adding a location server, it must be synchronized with NCS. See the "Synchronizing Services" section on page 16-11 for more information.

Note Location and mobility services engine features of NCS do not support partitioning.

Synchronizing Services

This section describes how to synchronize Cisco wireless LAN controllers and NCS with mobility services engines and contains the following topics:

Keeping Mobility Services Engines Synchronized

This section describes how to synchronize NCS and mobility services engines manually and automatically.

After adding a mobility service engine to NCS, you can push (synchronize) network designs (campus, building, floor, and outdoor maps), event groups, controller information (name and IP address), or wired switches to the mobility services engine.

Note Be sure to verify software compatibility between the controller, NCS, and the mobility services engine before performing synchronization. See the latest mobility services engine release notes at the following URL: http://www.cisco.com/en/US/products/ps9742/tsd_products_support_series_home.html.

Note Communication between the mobility services engine, NCS, and the controller is in Coordinated Universal Time (UTC). Configuring NTP on each system provides devices with the UTC time. The mobility services engine and its associated controllers must be mapped to the same NTP server and the same NCS server. An NTP server is required to automatically synchronize time between the controller, NCS, and the mobility services engine.

Synchronizing NCS and a Mobility Services Engine

This section describes how to synchronize NCS and mobility services engines manually and smartly.

After adding a mobility services engine to NCS, you can synchronize network designs (campus, building, floor, and outdoor maps), controllers (name and IP address), specific Catalyst 3000 Series and 4000 switches, and event groups with the mobility services engine.

- Network Designs—Is a logical mapping of the physical placement of access points throughout facilities. A hierarchy of a single campus, the buildings that comprise that campus and the floors of each building constitute a single network design.
- Controllers—A selected controller that is associated and regularly exchanges location information with a mobility services engine. Regular synchronization ensures location accuracy.
- Event Groups—A group of predefined events that define triggers that generate an event. Regular synchronization ensures that the latest defined events are tracked.
- Wired Switches —Wired Catalyst switches that provide an interface to wired clients on the network. Regular synchronization ensures that location tracking of wired clients in the network is accurate.
  - The mobility services engine can be synchronized with Catalyst stackable switches (3750, 3750-E, 3560, 2960, IE-3000 switches), switch blades (3110, 3120, 3130, 3040, 3030, 3020), and switch ports.

  - The mobility services engine can also be synchronized with the following Catalyst series switches 4000: 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

- Third Party Elements—When you synchronize elements with MSE, there might be event groups on the MSE that have been created by third-party applications. You can either delete the unused elements or mark them as third-party elements.
- Service Advertisements—MSAP provides service advertisements on the mobile devices. This shows the service advertisement that has synchronized with the MSE.

Note Be sure to verify software compatibility between the controller, Cisco NCS, and the mobility services engine before synchronizing. See the latest mobility services engine release notes at the following URL: http://www.cisco.com/en/US/products/ps9742/tsd_products_support_series_home.html.

Note Communication between the mobility services engine, NCS, and the controller is in Coordinated Universal Time (UTC). Configuring NTP on each system provides devices with the UTC time. The mobility services engine and its associated controllers must be mapped to the same NTP server and the same Cisco NCS server. An NTP server is required to automatically synchronize time between the controller, Cisco NCS, and the mobility services engine.

Synchronizing NCS Network Designs, Controllers, Wires Switches, or Group Events

To synchronize NCS network designs, controllers, wired switches, or event groups with the mobility services engine, follow these steps:

Step 1 Choose **Services > Synchronize Services**.

Step 2 Choose the appropriate menu option (Network Designs, Controllers, Wired Switches, or Event Groups).

Step 3 To assign a network design to a mobility services engine, from the left sidebar menu, choose **Network Designs**.

Step 4 Choose the maps that you want to be synchronized with the mobility services engine from the Type drop-down list.

Note Through 6.0, you can assign only up to a campus level to a mobility services engine. Beginning with 7.0 this option is granular to a floor level. For example, you can choose to assign floor1 to MSE 1, floor2 to MSE 2, and floor3 to MSE 3.

Step 5 Click **Change MSE Assignment**.

Step 6 Select the mobility services engine to which the maps are to be synchronized.

Note A network design might include a floor in a campus or a large campus with several buildings, each monitored by a different mobility services engine. Because of this, you might need to assign a single network design to multiple mobility services engines.

Step 7 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.

You can use the same procedure to assign wired switches or event groups to a mobility services engine. See the "Synchronizing Controllers with Mobility Services Engines" section on page 16-14 for more information to assign a controller to a mobility services engine.

Step 8 Click **Cancel** to discard the changes made to the mobility services engine assignment and return to the Network Designs page.

You can also click **Reset** to undo the mobility services engine assignments.

Note Event groups can also be created by third-party applications. See the "Working with Third-Party Elements" section on page 16-15 for more information on Third-party application-created event groups.

Note You cannot unassign a network design and controller by clicking Change MSE Assignment if you are using the MSAP service because you defined the APs from the Service Advertisements tab. If you want to unassign, click **Service Advertisements** tab, click **Change MSE Assignment** and unselect the **service** check box if you do not want the elements to be associated.

To unassign a network design, controller, wired switch, or event group from a mobility services engine, follow these steps:

Step 1 On the respective tabs, click one or more elements, and click **Change MSE Assignment**. The Choose Mobility Services Engine dialog box appears.

Step 2 Unselect the **Mobility Services Engine** check box if you do not want the elements to be associated with that mobility services engine.

Step 3 Click **Save** to save the changes to the assignments.

Step 4 Click **Synchronize**. The Sync Status column appears blank.

Synchronizing Controllers with Mobility Services Engines

You can assign an MSE to any wireless controller on a per-service (CAS or wIPS) basis.

To assign an MSE service to wireless controllers, follow these steps:

Step 1 In the synchronization page, choose **Controllers**.

Step 2 Choose the controllers to be assigned to the mobility services engine.

Step 3 Click **Change MSE Assignment**.

Step 4 Choose the mobility services engine to which the controllers must be synchronized.

Step 5 Click either of the following in the dialog box:

- **Save**—Saves the mobility services engine assignment. The following message appears in the Messages column of the Controllers page:

To be assigned - Please synchronize.

- **Cancel**—Discards the changes to the mobility services engine assignment and returns to the Controllers page.

  You can also click **Reset** to undo the yellow button assignments.

Step 6 Click **Synchronize** to complete the synchronization process.

Step 7 Verify that the mobility services engine is communicating with each of the controllers for only the chosen service. This can be done by clicking the **NMSP status** link in the status page.

Note After Synchronizing a controller, verify that the timezone is set on the associated controller. See the "Setting and Verifying the Timezone on a Controller" section on page 16-16 for more information.

Note Controller names must be unique for synchronizing with a mobility services engine. If you have two controllers with the same name, only one is synchronized.

To unassign a network design, controller, wired switch, or event group from a mobility services engine, follow these steps:

Step 1 On the respective tabs, click one or more elements, and click **Change MSE Assignment**. The Choose Mobility Services Engine dialog box appears.

Step 2 Unselect the **Mobility Services Engine** check box if you do not want the elements to be associated with that mobility services engine.

Step 3 Click **Save** to save the changes to the assignments.

Step 4 Click **Synchronize**. A two-arrow icon appears in the Sync Status column.

Working with Third-Party Elements

When you synchronize elements with MSE, there might be event groups on the MSE that have been created by third-party applications. You can either delete the unused elements or mark them as third-party elements.

To delete the elements or mark them as third-party elements, follow these steps:

Step 1 In the synchronization page, choose **Third Party Elements** from the left sidebar menu.

The Third Party Elements page appears.

Step 2 Choose one or more elements.

Step 3 Click one of the following buttons:

- **Delete Event Groups**—Deletes the selected event groups.
- **Mark as 3rd Party Event Group(s)**—Marks the selected event groups as third-party event groups.

Setting and Verifying the Timezone on a Controller

For controller releases 4.2 and later, if a mobility services engine (release 5.1 or greater) is installed in your network, it is mandatory that the time zone be set on the controller to ensure proper synchronization between the two systems.

Greenwich Mean Time (GMT) is used as the standard for setting the time zone system time of the controller.

You can automatically set the time zone during initial system setup of the controller or manually set it on a controller already installed in your network.

To manually set the time and time zone on an existing controller in your network using the CLI, follow these steps:

Step 1 Configure the current local time in GMT on the controller by entering the following commands:

```
(Cisco Controller) >config time manual 09/07/07 16:00:00
(Cisco Controller) >config end
```

Note When setting the time, the current local time is entered in terms of GMT and as a value between 00:00 and 24:00. For example, if it is 8 AM Pacific Standard Time (PST) in the US, you enter 16:00 (4 PM PST) as the PST time zone is 8 hours behind GMT.

Step 2 Verify that the current local time is set in terms of GMT by entering the following command:

```
(Cisco Controller) >show time
Time..................................... Fri Sep 7 16:00:02 2007
Timezone delta.............................. 0:0
```

Step 3 Set the local time zone for the system by entering the following commands:

Note When setting the time zone, you enter the time difference of the local current time zone with respect to GMT (+/-). For example, Pacific Standard Time (PST) in the United States (US) is 8 hours behind GMT (UTC) time. Therefore, it is entered as -8.

```
(Cisco Controller) >config time timezone -8
(Cisco Controller) >config end
```

Step 4 Verify that the controller shows the current local time with respect to the local time zone rather than in GMT by entering the following command:

```
(Cisco Controller) >show time
Time..................................... Fri Sep 7 08:00:26 2007
Timezone delta.............................. -8:0
```

Note The time zone delta parameter in the **show time** command shows the difference in time between the local time zone and GMT (8 hours). Before configuration, the parameter setting is 0.0.

Configuring Smart Mobility Services Engine Database Synchronization

Manual synchronization of NCS and mobility services engine databases provides immediate synchronization. However, future deployment changes (such as making changes to maps and access point positions), can yield incorrect location calculations and asset tracking until resynchronization reoccurs.

To prevent out-of-sync conditions, use NCS to carry out synchronization. This policy ensures that synchronization between NCS and mobility services engine databases is triggered periodically and any related alarms are cleared.

Any change to one or more of any synchronized components is automatically synchronized with the mobility services engine. For example, if a floor with access points is synchronized with a particular mobility services engine and then one access point is moved to a new location on the same floor or another floor which is also synchronized with the mobility services engine, then the changed location of the access point is automatically communicated.

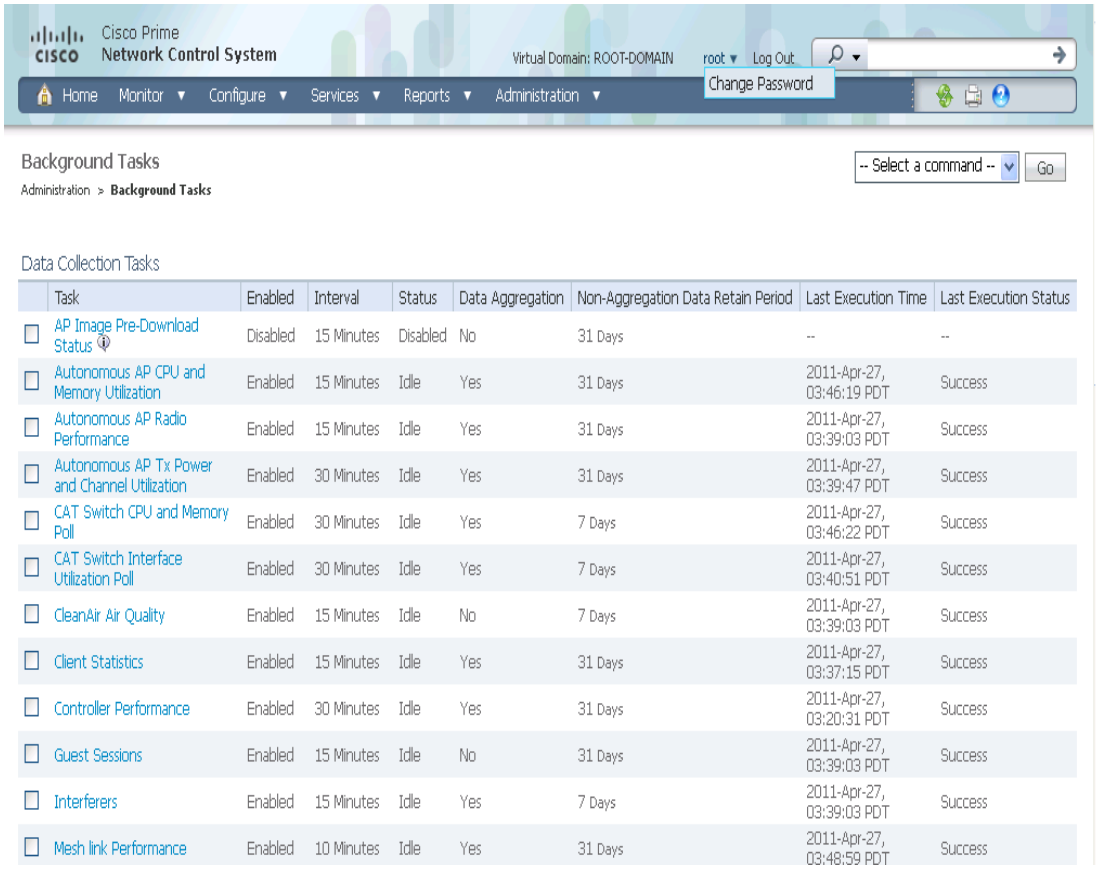
To further ensure that NCS and MSE are in sync, smart synchronization happens in the background.

To configure smart synchronization, follow these steps:

Step 1 Choose **Administration > Background Tasks**.

The Background Tasks summary page appears (see Figure 16-1).

Figure 16-1 Administration > Background Tasks



Step 2 Select the **Mobility Service Synchronization** check box.

Step 3 Click the **Mobility Service Synchronization** link.

The Task > Mobility Service Synchronization page appears.

Step 4 To set the mobility services engine to send out-of-sync alerts, select the **Enabled** check box in the Out of Sync Alerts group box.

Step 5 To enable smart synchronization, select the Smart Synchronization **Enabled** check box.

Note

- Smart synchronization does not apply to elements (network designs, controllers, or event groups) that have not yet been assigned to a mobility services engine. However, out-of-sync alarms are still generated for these unassigned elements. For smart synchronization to apply to these elements, you need to manually assign them to a mobility services engine.
- When a mobility services engine is added to an NCS, the data in the NCS is always treated as the primary copy that is synchronized with the mobility services engine. All synchronized network designs, controllers, event groups and wired switches that are present in the mobility services engine and not in the NCS are removed automatically from mobility services engine.

Step 6 Enter the time interval in minutes that the smart synchronization is to be performed.

By default, smart-sync is disabled.

Step 7 Click **Submit**.

See the "Smart Controller Assignment and Selection Scenarios" section on page 16-19 for more information on smart controller assignment and selection scenarios.

Smart Controller Assignment and Selection Scenarios

Scenario 1

If a floor having at least one access point from a controller is chosen to be synchronized with the mobility services engine from the Network Designs section of the Synchronization page, then the controller to which that access point is connected is automatically selected to be assigned to the mobility services engine for CAS service.

Scenario 2

When at least one access point from a controller is placed on a floor that is synchronized with mobility services engine, the controller to which the access point is connected is automatically assigned to the same mobility services engine for CAS service.

Scenario 3

An access point is added to a floor and is assigned to an mobility services engine. If that access point is moved from controller A to controller B, then controller B is automatically synchronized to the mobility services engine.

Scenario 4

If all access points placed on a floor which is synchronized to the mobility services engine are deleted then that controller is automatically removed from mobility services engine assignment or unsynchronized.

Out-of-Sync Alarms

Out-of-sync alarms are of Minor severity (yellow) and are raised in response to the following conditions:

- Elements have been modified in NCS (the auto-sync policy pushes these elements).
- Elements have been modified in the mobility services engine.
- Elements except controllers exist in the mobility services engine database but not in NCS.
- Elements have not been assigned to any mobility services engine (the auto-sync policy does not apply).

Out-of-sync alarms are cleared when the following occurs:

- The mobility services engine is deleted

Note When you delete a mobility services engine, the out-of-sync alarms for that system is also deleted. In addition, if you delete the last available mobility services engine, the alarms for "elements not assigned to any server" are also deleted.

- Elements are synchronized manually or automatically
- User manually clears the alarms (although the alarms might reappear the future when the scheduled task is next executed)

Note By default, out-of-sync alarms are enabled. You can disable them in NCS by choosing **Administration > Scheduled Tasks**, clicking **Mobility Service Synchronization**, unselecting the **Auto Synchronization** check box, and clicking **Submit**.

Viewing Mobility Services Engine Synchronization Status

You can use the Synchronize Servers command in NCS to view the status of network design, controller, and event group synchronization with a mobility services engine.

To view synchronization status, follow these steps:

Step 1 Choose **Services > Synchronize Services**.

Step 2 Choose the applicable menu option (**Network Designs**, **Controllers**, or **Event Groups**).

For each of the elements, the Sync. Status column shows the synchronization status. A green two-arrow icon indicates that its corresponding element is synchronized with the specified server such as a mobility services engine. A gray two-arrow icon with a red circle indicates that its corresponding item is not synchronized with a given server.

Note A green two-arrow icon does not indicate the NMSP connection status for a controller.

You can also view the synchronization status and assign or unassign from the campus view and building view along with floor view.

To access this page, choose **Monitor > Maps > System Campus >** *Building* **>** *Floor*

where *Building* is the building within the campus and *Floor* is a specific floor in that campus building.

The MSE Assignment option on the left sidebar menu shows which mobility services engine the floor is currently assigned to. You can also change mobility services engine assignment from this page.

Viewing Synchronization History

You can use the Synchronization History command in NCS to view the synchronization history for the last 30 days for a mobility services engine. This is especially useful when automatic synchronization is enabled as alarms are automatically cleared. Synchronization History provides a summary of those cleared alarms.

To view synchronization history, choose **Services > Synchronization History** and click the column headers to sort the entries.

Viewing Notification Statistics

You can view the notification statistics for a specific mobility services engine. To view the Notification Statistics for a specific mobility services engine:

Choose **Services > Mobility Services >** *MSE-name* **> Context Aware Service > Notification Statistics**.

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

Table 16-1 describes the fields in the Notification statistics page.

Table 16-1 Notification Statistics fields

Field	Description
Summary	
Destinations	
Total	Total destination count.
Unreachable	Unreachable destination count.
Notification Statistics Summary	
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.
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 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.

Configuring High Availability

The mobility services engine is a platform for hosting multiple mobility applications. Every active MSE is backed up by another inactive instance. The main component of high availability system is the health monitor. The health monitor configures, manager, and monitors the high availability setup. Heartbeat is maintained between the primary and secondary MSE. Health monitor is responsible for setting up database, file replication, and monitoring the application. When the primary MSE fails and secondary takes over, the virtual address of the primary MSE is switched transparently.

The following are some information about the architecture:

- Every active primary MSE is backed up by another inactive instance. The secondary MSE becomes active only after the failover procedure is initiated.
- The failover procedure can be manual or automatic.
- One secondary MSE can support two primary MSEs.
- There is one software and database instance for each registered primary MSE.

This section provides information on the following:

Pairing Matrix

The Table 16-13 gives information on the pairing matrix.

Table 16-2 Pairing Matrix

	Secondary Server Type							
Primary Server Type		3310	3350	3355	VA-2	VA-3	VA-4	VA-5
	3310	Y	Y	Y	N	N	N	N
	3350	N	Y	Y	N	N	N	N
	3355	N	Y	Y	N	N	N	N
	VA-2	N	N	N	Y	Y	Y	Y
	VA-3	N	N	N	N	Y	Y	Y
	VA-4	N	N	N	N	N	Y	Y
	VA-5	N	N	N	N	N	N	Y

The Table 16-13 gives information on the pairing matrix.

Table 16-3 Pairing Matrix

Secondary Server	**Primary Server**
3310	N:1 not supported
3350	Two 3310 servers are supported
3355	Two 3310 servers are supported
3355	Two 3350 servers are supported
3355	One 3310 and one 3350 are supported

Guidelines and Limitations for High Availability

- Both the health monitor IP and Virtual IP should be accessible from NCS.
- Always health monitor IP and virtual IP should be different.
- You can use either manual or automatic failover.
- You can use either manual or automatic failback.
- Both primary and secondary MSE should be on the same software version.

Failover Scenario for High Availability

When a failure of a primary MSE is detected, the following events take place:

Note One secondary MSE can back two primary devices.

- The primary MSE is confirmed as non-functioning (hardware fail, network fail, and so on) by the health monitor on the secondary MSE.
- If automatic failover has been enabled, MSE is started on the secondary immediately and uses the corresponding database of the primary MSE.
- Failback is invoked and the primary MSE takes back all the operations.
- The result of the failover operation is indicated as an event in the Health Monitor UI, and critical alarm is sent to the administrator.

Failback

When the primary MSE is restored to its normal state if the secondary MSE is already failing over for the primary, then failback can be invoked.

Failback can occur only if the secondary MSE is in one of the following states for the primary instance:

- The secondary MSE is actually failing over for the primary MSE.
- If manual failover is configured but the administrator did not invoke it.
- The primary failed but the secondary MSE cannot take over because it has encountered some errors or it is failing over another primary MSE.
- Failback can occur only if the administrator starts up the failed primary MSE.

HA Licensing

There is no separate license required to set up an MSE HA system.

Configuring High Availability on the MSE

Configuring high availability on the MSE involves the following two steps:

- During the installation of the MSE software, you must perform certain configurations using the command-line client.
- Pair up the primary and secondary MSE from the NCS UI.

Note If you do not want high availability support and if you are upgrading from an older release, you can continue to use the old IP address for the MSE. If you want to set up high availability, then you must configure the health monitor IP address. The health monitor then becomes a virtual IP address.

Note By default, all MSEs are configured as primary.

To configure high availability on the primary MSE, follow these steps:

Step 1 Ensure that the network connectivity between the primary and secondary is functioning and that all the necessary ports are open.

Step 2 Install the correct version of MSE on the primary MSE.

Step 3 Make sure that the same MSE release version that is loaded on the other primary MSE and secondary MSE is also loaded on the new primary MSE.

Step 4 On the intended primary MSE, enter the following command:

```
/opt/mse/setup/setup.sh
----------------------------------------------------------------
Welcome to the appliance setup.
Please enter the requested information.  At any prompt,
enter ^ to go back to the previous prompt. You may exit at
any time by typing <Ctrl+C>.
You will be prompted to choose whether you wish to configure a
parameter, skip it, or reset it to its initial default value.
Skipping a parameter will leave it unchanged from its current
value.
Changes made will only be applied to the system once all the
information is entered and verified.
----------------------------------------------------------------
```

Step 5 Configure the hostname:

```
Current hostname=[mse]
Configure hostname? (Y)es/(S)kip/(U)se default [Skip]:
```

The hostname should be a unique name that can identify the device on the network. The hostname should start with a letter, end with a letter or number, and contain only letters, numbers, and dashes.

Step 6 Configure the domain name:

Enter a domain name for the network domain to which the device belongs. The domain name should start with a letter, and it should end with a valid domain name suffix such as *.com*. It must contain only letters, numbers, dashes, and dots.

```
Current domain=[]
Configure domain name? (Y)es/(S)kip/(U)se default [Skip]:
```

Step 7 Configure the HA role:

```
Current role=[Primary]
Configure High Availability?  (Y)es/(S)kip/(U)se default [Skip]:
High availability role for this MSE (Primary/Secondary):
Select role [1 for Primary, 2 for Secondary] [1]: 1
Health monitor interface holds physical IP address of this MSE server.
```

```
This IP address is used by Secondary, Primary MSE servers and NCS to communicate among
themselves
Select Health Monitor Interface [eth0/eth1] [eth0]:eth0
------------------------------------------------------------------
Direct connect configuration facilitates use of a direct cable connection between the
primary and secondary MSE servers.
This can help reduce latencies in heartbeat response times, data replication and failure
detection times.
Please choose a network interface that you wish to use for direct connect. You should
appropriately configure the respective interfaces.
\"none\" implies you do not wish to use direct connect configuration.
------------------------------------------------------------------
```

Step 8 Configure Ethernet interface parameters:

```
Select direct connect interface [eth0/eth1/none] [none]: eth0
Enter a Virtual IP address for first this primary MSE server:
Enter Virtual IP address [172.31.255.255]:
Enter the network mask for IP address 172.31.255.255.
Enter network mask [255.255.255.0]:
Current IP address=[172.31.255.255]
Current eth0 netmask=[255.255.255.0]
Current gateway address=[172.31.255.256
Configure eth0 interface parameters? (Y)es/(S)kip/(U)se default [Skip]:
```

Step 9 When prompted for "eth1" interface parameters, enter Skip to proceed to the next step. A second NIC is not required for operation:

```
Configure eth1 interface parameters? (Y)es/(S)kip/(U)se default [Skip]:
```

Follow Step 10 through Step 13 to configure the secondary MSE.

Step 10 Configure the hostname for the secondary MSE:

```
Current hostname=[]
Configure hostname? (Y)es/(S)kip/(U)se default [Skip]:
```

Step 11 Configure the domain name:

```
Current domain=
Configure domain name? (Y)es/(S)kip/(U)se default [Skip]:
```

Step 12 Configure the HA role:

```
Current role=[Primary]
Configure High Availability?  (Y)es/(S)kip/(U)se default [Skip]:
High availability role for this MSE (Primary/Secondary)
Select role [1 for Primary, 2 for Secondary] [1]: 2
Health monitor interface holds physical IP address of this MSE server.
This IP address is used by Secondary, Primary MSE servers and NCS to communicate among
themselves
Select Health Monitor Interface [eth0/eth1] [eth0]:[eth0/eth1]
------------------------------------------------------------------
Direct connect configuration facilitates use of a direct cable connection between the
primary and secondary MSE servers.
This can help reduce latencies in heartbeat response times, data replication and failure
detection times.
Please choose a network interface that you wish to use for direct connect. You should
appropriately configure the respective interfaces.
\"none\" implies you do not wish to use direct connect configuration.
------------------------------------------------------------------
```

Step 13 Configure ethernet interface parameters:

```
Select direct connect interface [eth0/eth1/none] [none]: eth1
Enter a Virtual IP address for first this primary MSE server
Enter Virtual IP address [172.19.35.61]:
Enter the network mask for IP address 172.19.35.61:
Enter network mask [255.255.254.0]:
Current IP address=[172.19.35.127]
Current eth0 netmask=[255.255.254.0]
Current gateway address=[172.19.34.1]
Configure eth0 interface parameters? (Y)es/(S)kip/(U)se default [Skip]:
```

Step 14 Once you have configured both the primary MSE and secondary MSE, the NCS UI should be used to set up a pairing between the primary and secondary MSE.

Step 15 Once the primary MSE is added successfully, choose **Services > High Availability** or click the primary MSE device in the **Services > Mobility Services Engine** page, and choose **HA Configuration > Service High Availability** from the left sidebar menu.

The HA Configuration page appears.

Step 16 Enter the secondary device name with which you want to pair the primary MSE.

Step 17 Enter the secondary IP address which is the health monitor IP address of the secondary MSE.

Step 18 Enter the secondary password. This is the NCS communication password configured on the MSE.

Step 19 Specify the failover type. You can choose either Manual or Automatic from the Failover Type drop-down list. After 10 seconds, the system fails over. The secondary server waits for a maximum of 10 seconds for the next heartbeat from the primary server. If it does not get the heartbeat in 10 seconds, it declares a failure.

Step 20 Specify the failback type by choosing either **Manual** or **Automatic** from the Failback Type drop-down list.

Step 21 Specify the Long Failover Wait in seconds.

After 10 seconds, the system fails over. The maximum failover wait is 2 seconds.

Step 22 Click **Save**.

The pairing and the synchronization happens automatically.

Step 23 To check whether the heartbeat is received from the primary MSE or not, choose **Services > Mobility Services Engine**, and click **Device Name** to view the configured parameters.

Step 24 Choose **HA Configuration > Service High Availability** from the left sidebar menu.

Check whether the heartbeat is received from the primary MSE or not.

Viewing Configured Parameters for High Availability

To view the configured parameters for high availability, follow these steps:

Step 1 Choose **Services > High Availability**.

Step 2 Click **Device Name** to view its configured parameters.

The HA configuration page appears.

Step 3 Choose **Services High Availability > HA Configuration** from the left sidebar menu. The HA Configuration page shows the following information:

- Primary Health Monitor IP
- Secondary Device Name
- Secondary IP Address
- Secondary Password
- Failover Type
- Failback Type
- Long Failover Wait

Viewing High Availability Status

To view the high availability status, follow these steps:

Step 1 Choose **Services > High Availability**.

Step 2 Click **Device Name** to view the desired status.

The HA Configuration page appears.

Step 3 Choose **Services High Availability > HA Status** from the left sidebar menu. The HA Configuration page shows the following information:

- Current high Availability Status
  - Status—Shows whether the primary and secondary MSE instances are correctly synchronized or not.
  - Heartbeats—Shows whether the heartbeat is received from the primary MSE or not
  - Data Replication—shows whether the data replication between the primary and secondary databases is happening or not.
  - Mean Heartbeat Response Time—shows the mean heartbeat response time between the primary and secondary MSE instance.
- Event Log—Shows all the events generated by the MSE. It shows the last 20 events.

Managing System Properties for a Mobility Services Engine

You can manage the system properties of a mobility services engine using the NCS. This section describes the various system properties of a mobility services engine and contains the following topics:

- Managing Maintenance for Mobility Services, page 16-42

Editing General Properties for a Mobility Services Engine

You can use NCS to edit the general properties of a mobility services engine registered in the NCS database. General properties include contact name, username, password, and HTTP.

To edit the general properties of a mobility services engine, follow these steps:

Step 1 Choose **Services > Mobility Services** to display the Mobility Services page.

Step 2 Click the name of the mobility services engine that you want to edit. The General Properties page (with a General tab and Performance tab) opens.

On the General tab, the following read-only server details appear:

- Device Name
- Device Type
- Device UDI

Note For licensing, the Device UID is the string between double quote characters (including spaces in the end, if any). Exclude the double quote characters using copy-paste.

- Version
- Start Time
- IP Address

Step 3 In the General Properties page, modify the following Server Details as necessary:

- Contact Name—Enter a contact name for the mobility service.
- Username—Enter the log in username for the NCS server that manages the mobility service.
- Password—Enter the log in password for the NCS server that manages the mobility service.
- HTTP—Select the **HTTP enable** check box to enable HTTP.

Note When you have a non-default port or HTTPS turned on, you must pass the correct information along with the command. For example, *getserverinfo* must include *-port <<port>> -protocol <<HTTP/HTTPS>>*. Similarly, for stopping the server, *stoplocserver -port <<port>> -protocol <HTTP/HTTPS>>*.

- Legacy Port—8001
- Legacy HTTPS—Select the check box to enable the legacy HTTPS.
- Delete synchronized service assignments and enable synchronization—Select the **Delete synchronized service assignments** check box if you want to permanently remove all service assignments from the mobility services engine. This option shows up only if the delete synchronized service assignments check box was unselected while adding a mobility services engine.

Note NCS always uses HTTPS to communicate with a mobility services engine.

Note The following tcp ports are in use on the MSE in Release 6.0: tcp 22: MSE SSH port, tcp 80: MSE HTTP port, tcp 443: MSE HTTPS port, tcp 1411: AeroScout, tcp 1999: AeroScout internal port, tcp 4096: AeroScout notifications port, tcp 5900X: AeroScout (X can vary from 1 to 10), and tcp 8001: Legacy port. Used for location APIs.

Note The following udp ports are in use on the MSE in Release 6.0: udp 123: NTPD port (open after NTP configuration), udp 162: AeroScout SNMP, udp/tcp 4000X: AeroScout proxy (X can vary from 1 to 5), udp 12091: AeroScout devices (TDOA Wi-Fi Receivers, chokepoints), udp 12092: AeroScout devices (TDOA Wi-Fi Receivers, chokepoints), udp 32768: Location internal port, udp 32769: AeroScout internal port, and udp 37008: AeroScout internal port.

Step 4 In the Mobility Services dialog box, select the **Admin Status** check box to enable the applicable (Context Aware Service or wIPS).

If you select Context Aware Service then you must select a location engine to perform location calculation.

Choose either of the following:

- Cisco Tag Engine

  or

- Partner Tag Engine

Note With MSE 6.0, you can enable multiple services (CAS and wIPS) simultaneously. Before Version 6.0, mobility services engines can only supported one active service at a time.

The Mobility Services dialog box also shows the following:

- Service Name
- Service Version
- Service Status
- License Type

Note Use the **Click here** link to view mobility services engine licensing details. See the "Mobility Services Engine (MSE) License Information" section on page 15-136 for more information.

Step 5 Click **Save** to update the NCS and mobility service databases.

Note Use the **Click here** link to view mobility services engine licensing details.

Step 6 Click the **Performance** tab to view a graph of CPU and memory utilization percentages.

Editing NMSP Parameters for a Mobility Services Engine

Network Mobility Services Protocol (NMSP) manages communication between the mobility service and the controller. Transport of telemetry, emergency, and RSSI values between the mobility service and the controller is managed by this protocol.

Note

- The NMSP parameter is supported in mobility services installed with Release 3.0 through 7.0.105.0. It is not supported on releases later than 7.0.105.0.
- NMSP replaces the LOCP term introduced in release 3.0.
- Telemetry and emergency information is only seen on controllers and NCS installed with release 4.1 software or greater and on mobility services running release 3.0 or later software.
- The TCP port (16113) that the controller and mobility service communicate over must be open (not blocked) on any firewall that exists between the controller and mobility service for NMSP to function.

The NMSP Parameters dialog box of NCS enables you to modify NMSP parameters such as echo and neighbor dead intervals as well as response and retransmit periods.

To configure NMSP parameters, follow these steps:

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

Step 2 Click the name of the mobility services engine whose properties you want to edit.

Step 3 From the left sidebar menu, choose **System > NMSP Parameters**.

Step 4 Modify the NMSP parameters as appropriate.

Note No change in the default parameter values is recommended unless the network is experiencing slow response or excessive latency.

NMSP parameters include the following:

- Echo Interval—Defines how frequently an echo request is sent from a mobility service to a controller. The default value is 15 seconds. Allowed values range from 1 to 120 seconds.

  Note If a network is experiencing slow response, you can increase the values of the echo interval, neighbor dead interval and the response timeout values to limit the number of failed echo acknowledgements.

- Neighbor Dead Interval—The number of seconds that the mobility service waits for a successful echo response from the controller before declaring the neighbor dead. This timer begins when the echo request is sent.

  The default values is 30 seconds. Allowed values range from 1 to 240 seconds.

  Note This value must be at least two times the echo interval value.

- Response Timeout—Indicates how long the mobility service waits before considering the pending request as timed out. The default value is one second. Minimum value is one (1). There is no maximum value.
- Retransmit Interval—Interval of time that the mobility service waits between notification of a response time out and initiation of a request retransmission. The default setting is 3 seconds. Allowed values range from 1 to 120 seconds.
- Maximum Retransmits—Defines the maximum number of retransmits that are done in the absence of a response to any request. The default setting is 5. Allowed minimum value is zero (0). There is no maximum value.

Step 5 Click ***Save*** to update the NCS and mobility service databases.

Viewing Active Session Details for a Mobility Services Engine

The Active Sessions dialog box of NCS enables you to view active user sessions on the mobility services engine.

To view active user sessions, follow these steps:

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

Step 2 Click the name of the mobility service.

Step 3 From the left sidebar menu, choose **System > Active Sessions**.

NCS shows a list of active mobility service sessions. For every session, NCS shows the following information:

- Session identifier
- IP address from which the mobility service is accessed
- Username of the connected user
- Date and time when the session started
- Date and time when the mobility service was last accessed
- How long the session was idle since the last access

Viewing and Adding Trap Destinations for a Mobility Services Engine

The Trap Destinations dialog box of NCS enables you to specify which NCS or Cisco Security Monitoring, Analysis, and Response System (CS-MARS) network management platform is the recipient of SNMP traps generated by the mobility services engine.

To view or manage trap destination for a mobility services engine, follow these steps:

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

Step 2 Click the name of the mobility service.

Step 3 From the left sidebar menu, choose **System > Trap Destinations**.

NCS shows a list of current trap destinations including the following information:

- IP address
- Port number
- Community
- Destination type
- SNMP Version

Use the Select a command drop-down list to add or delete a trap destination.

To add a trap destination, follow these steps:

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

Step 2 Click the name of the mobility service.

Step 3 From the left sidebar menu, choose **System > Trap Destinations**.

Step 4 Choose **Add Trap Destination** from the command drop-down list.

The New Trap Destination page appears.

Step 5 Enter the following details (see Table 16-4).

Table 16-4 Add Trap Destination page

Field	Description
IP Address	IP address for the trap destination
Port Number	Port number for the trap destination. The default port number is 162.
Destination Type	This field is not editable and has a value of **Other**.
SNMP Version	Select either v2c or v3.
The following set of fields appear only if you select v3 as the SNMP version.	
User Name	Username for the SNMP Version 3.
Security Name	Security name for the SNMP Version 3.
Authentication Type	Select one of the following: HMAC-MD5 HMAC-SHA
Authentication Password	Authentication password for the SNMP Version 3.
Privacy Type	Select one of the following: CBC-DES CFB-AES-128 CFB-AES-192 CFB-AES-256
Privacy Password	Privacy password for the SNMP Version 3.

Step 6 Click **Save** to save the changes or **Cancel** to discard the changes.

Editing Advanced Parameters for a Mobility Services Engine

The Advanced Parameters dialog box of NCS enables you to set the number of days events are kept, set session time out values, set an absent data interval cleanup interval, and enable or disable Advanced Debug.

Note You can use NCS to modify troubleshooting parameters for a mobility services engine.

To edit advanced parameters for a mobility services engine, follow these steps:

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

Step 2 Click the name of the mobility service whose properties you want to edit.

Step 3 From the left sidebar menu, choose **System > Advanced Parameters**.

Step 4 View or modify the advanced parameters as necessary.

- General Information
- Advanced Parameters

Caution Because advanced debugging slows the mobility service down, enable advanced debugging only under the guidance of Cisco TAC personnel.

  - Number of Days to keep Events—Enter the number of days to keep logs. Change this value as required for monitoring and troubleshooting.
  - Session Timeout—Enter the number of minutes before a session times out. Change this value as required for monitoring and troubleshooting. Currently this option appears dimmed.
- Cisco UDI
  - Product Identifier (PID)—The Product ID of the mobility services engine.
  - Version Identifier (VID)—The version number of the mobility services engine.
  - Serial Number (SN)—Serial number of the mobility services engine.
- Advanced Commands
  - Reboot Hardware—Click to reboot the mobility service hardware. See the "Rebooting the Mobility Services Engine Hardware" section on page 16-34 for more information.
  - Shutdown Hardware—Click to turn off the mobility service hardware. See the "Shutting Down the Mobility Services Engine Hardware" section on page 16-34 for more information.
  - Clear Database—Click to clear the mobility services database. See the "Clearing the Mobility Services Engine Database" section on page 16-34 for more information. Unselect the **Retain current service assignments in NCS** check box to remove all existing service assignments from NCS and MSE. The resources have to be reassigned from **Services > Synchronize Services** page. This option is selected by default.

Step 5 Click **Save** to update the NCS and mobility service databases.

Rebooting the Mobility Services Engine Hardware

If you need to restart a mobility services engine, follow these steps:

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

Step 2 Click the name of the mobility services engine that you want to reboot.

Step 3 Click **System**.

Step 4 Click **Advanced Parameters**.

Step 5 In the Advanced Commands dialog box, click **Reboot Hardware**.

Step 6 Click **OK** to confirm that you want to reboot the mobility services engine hardware.

The rebooting process takes a few minutes to complete.

Shutting Down the Mobility Services Engine Hardware

If you need to shut down a mobility services engine, follow these steps:

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

Step 2 Click the name of the mobility services engine that you want to shut down.

Step 3 Click **System**.

Step 4 Click **Advanced Parameters**.

Step 5 In the Advanced Commands dialog box, click **Shutdown Hardware**.

Step 6 Click **OK** to confirm that you want to shut down the mobility services engine.

Clearing the Mobility Services Engine Database

To clear a mobility services engine configuration and restore its factory defaults, follow these steps:

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

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

Step 3 Click **System**.

Step 4 Click **Advanced Parameters**.

Step 5 In the Advanced Commands dialog box, unselect the **Retain current service assignments in NCS** check box to remove all existing service assignments from NCS and MSE.

The resources have to be reassigned in the Services > Synchronize Services page. By default, this option is selected.

Step 6 In the Advanced Commands dialog box, click **Clear Database**.

Step 7 Click **OK** to clear the mobility services engine database.

Working with Logs

This section describes how to configure logging options and how to download log files and contains the following topics:

Configuring Logging Options

You can use NCS to specify the logging level and types of messages to log.

To configure logging options, follow these steps:

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

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

Step 3 Choose **System > Logs**. The advanced parameters for the selected mobility services engine appear.

Step 4 Choose the appropriate options from the Logging Level drop-down list.

There are four logging options: Off, Error, Information, and Trace.

All log records with a log level of Error or preceding are logged to a new error log file locserver-error-%u-%g.log. This is an additional log file maintained along with the location server locserver-%u-%g.log log file. The error log file consists of logs of Error level along with their context information. The contextual information consists of 25 log records prior to the error. You can maintain upto 10 error log files. The maximum size allowed for each log file is 10 MB.

Caution Use Error and Trace only when directed to perform so by Cisco TAC personnel.

Step 5 Select the **Enabled** check box next to each element listed in that section to begin logging its events.

Step 6 Select the **Enable** check box in the Advanced Parameters dialog box to enable advanced debugging. By default, this option is disabled.

Step 7 To download log files from the server, click **Download Logs**. See the "Downloading Mobility Services Engine Log Files" section on page 16-36 for more information.

Step 8 In the Log File group box, enter the following:

- The number of log files to be maintained in the mobility services engine. You can maintain a minimum of 5 log files and a maximum of 20 log files in the mobility services engine.
- The maximum log file size in MB. The minimum log file size is 10 MB and the maximum is 50 MB.

Step 9 In the MAC Address Based Logging group box, do the following:

- Select the **Enable** check box to enable MAC address logging. By default, this option is disabled.
- Add one or more MAC addresses for which you want to enable logging. You can also remove MAC addresses that you have already added by selecting the MAC address from the list and clicking **Remove**.

See the "MAC Address-based Logging" section on page 16-36 for more information on MAC Address-based logging.

Step 10 Click **Save** to apply your changes.

MAC Address-based Logging

This feature allows you to create log files that are specific to an entity whose MAC address is specified. The log files are created in the locserver directory under the following path:

/opt/mse/logs/locserver

A maximum of 5 MAC addresses can be logged at a time. The Log file format for MAC address aa:bb:cc:dd:ee:ff is macaddress-debug-aa-bb-cc-dd-ee-ff.log

You can create a maximum of two log files for a MAC Address. The two log files might consist of one main and one backup or rollover log file.

The minimum size of a MAC log file is 10 MB. The maximum size allowed is 20 MB per MAC Address. The MAC log files that are not updated for more than 24 hours are pruned.

Downloading Mobility Services Engine Log Files

If you need to analyze mobility services engine log files, you can use NCS to download them to your system. NCS downloads a zip file containing the log files.

To download a zip file containing the log files, follow these steps:

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

Step 2 Click the name of the mobility services engine to view its status.

Step 3 From the left sidebar menu, choose **Logs**.

Step 4 Click **Download Logs**.

Step 5 Follow the instructions in the File Download dialog box to open the file or save the zip file to your system.

Managing User and Group Accounts for a Mobility Services Engine

This section describes how to configure and manage users and groups on the mobility services engine.

This section describes how to add, delete, and edit users for a mobility services engine and contains the following topics:

- Adding Users for a Mobility Services Engine, page 16-37
- Deleting Users, page 16-37
- Editing User Properties, page 16-38

Note See the "Viewing Active Session Details for a Mobility Services Engine" section on page 16-31 for information on viewing active sessions for each user.

- Managing Group Accounts—This section describes how to add, delete, and edit user groups for a mobility services engine and contains the following topics:
  - Adding User Groups, page 16-38
  - Deleting User Groups, page 16-38
  - Editing Group User Permissions, page 16-39

Adding Users for a Mobility Services Engine

To add a users to a mobility services engine, follow these steps:

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

Step 2 Click the device name of the mobility services engine that you want to edit.

Step 3 From the left sidebar menu, choose **Systems > Accounts > Users**.

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

Step 5 Click **Go**.

Step 6 Enter the username in the Username text box.

Step 7 Enter a password in the Password text box.

Step 8 Enter the name of the group to which the user belongs in the Group Name text box.

Step 9 Choose a permission level from the Permission drop-down list.

There are three permission levels to choose from: Read Access, Write Access, and Full Access (required for NCS to access a mobility services engine).

Caution Group permissions override individual user permissions. For example, if you give a user full access and add that user to a group with read access, that user is unable to configure mobility services engine settings.

Step 10 Click **Save** to add the new user to the mobility services engine.

Deleting Users

To delete a user from a mobility services engine, follow these steps:

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

Step 2 Click the device name of the mobility services engine that you want to edit.

Step 3 From the left sidebar menu, choose **Systems > Accounts > Users**.

Step 4 Select the check box(es) of the user(s) that you want to delete.

Step 5 From the Select a command drop-down list, choose **Delete User**.

Step 6 Click **Go**.

Step 7 Click **OK** to confirm that you want to delete the selected users.

Editing User Properties

To change user properties, follow these steps:

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

Step 2 Click the device name of the mobility services engine that you want to edit.

Step 3 From the left sidebar menu, choose **Systems > Accounts > Users**.

Step 4 Click the username of the user that you want to edit.

Step 5 Make the required changes to the Password, Group Name, and Permission text boxes.

Step 6 Click **Save** to apply your change.

Adding User Groups

To add a user group to a mobility services engine, follow these steps:

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

Step 2 Click the device name of the mobility services engine that you want to edit.

Step 3 From the left sidebar menu, choose **Systems > Accounts > Groups**.

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

Step 5 Click **Go**.

Step 6 Enter the name of the group in the Group Name text box.

Step 7 Choose a permission level from the Permission drop-down list.

There are three permissions levels to choose from:

- **Read Access**
- **Write Access**
- **Full Access** (required for NCS to access mobility services engines)

Step 8 Click **Save** to add the new group to the mobility services engine.

Caution Group permissions override individual user permissions. For example, if you give a user full access and add that user to a group with read access permission, that user cannot configure mobility services engine settings.

Deleting User Groups

To delete user groups from a mobility services engine, follow these steps:

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

Step 2 Click the device name of the mobility services engine that you want to edit.

Step 3 From the left sidebar menu, choose **Systems > Accounts > Groups**.

Step 4 Select the check box(es) of the group(s) that you want to delete.

Step 5 From the Select a command drop-down list, choose **Delete Group**.

Step 6 Click **Go**.

Step 7 Click **OK** to confirm that you want to delete the selected users.

Editing Group User Permissions

To change user group permissions, follow these steps:

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

Step 2 Click the device name of the mobility services engine that you want to edit.

Step 3 From the left sidebar menu, choose **Systems > Accounts > Groups**.

Step 4 Click the group name of the group that you want to edit.

Step 5 Choose a permission level from the Permission drop-down list.

Step 6 Click **Save** to apply your change.

Caution Group permissions override individual user permissions. For example, if you give a user permission for full access and add that user to a group with read access, that user is unable to configure mobility services engine settings.

Monitoring Status Information for a Mobility Services Engine

The System > Status page enables you to monitor server events, NCS alarms and events, and NMSP connection status for the mobility services engine.

This section provides additional information and contains the following topics:

- Viewing Server Events for a Mobility Services Engine, page 16-39
- Viewing NCS Alarms for a Mobility Services Engine, page 16-40
- Viewing NCS Events for a Mobility Services Engine, page 16-40
- Viewing NMSP Connection Status for a Mobility Services Engine, page 16-41

Viewing Server Events for a Mobility Services Engine

To view a list of server events, follow these steps:

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

Step 2 Click the name of the applicable mobility services engine.

Step 3 From the left sidebar menu, choose **System > Status > Server Events**.

The Status > Server Events page provides the following information:

- Timestamp—Time of the server event.
- Severity—Severity of the server event.
- Event—Detailed description of the event.
- Facility—The facility in which the event took place.

Viewing Audit Logs from a Mobility Services Engine

You can view the audit logs for User-triggered operations using the Audit Logs option available in a Mobility Services Engine. To view the audit logs, follow these steps:

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

Step 2 Click the name of the applicable mobility services engine.

Step 3 From the left sidebar menu, choose **System > Status > Audit Logs**.

The **Status > Audit Logs** page provides the following information:

- Username—The Username which has triggered the audit log.
- Operation—The operation that has been performed by the User.
- Operation Status—The status of the operation and it can be SUCCESSFUL or FAILED.
- Invocation Time—The date and time at which the audit log was recorded for the specified operation.

Viewing NCS Alarms for a Mobility Services Engine

To view a list of NCS alarms, follow these steps:

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

Step 2 Click the name of the applicable mobility service.

Step 3 From the left sidebar menu, choose **System > Status > NCS Alarms**. See the "Monitoring Alarms" section on page 5-134 for more information.

Viewing NCS Events for a Mobility Services Engine

To view a list of NCS events, follow these steps:

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

Step 2 Click the name of the applicable mobility service.

Step 3 From the left sidebar menu, choose **System > Status > NCS Events**. See the "Monitoring Events" section on page 5-152 for more information.

Viewing NMSP Connection Status for a Mobility Services Engine

The NMSP Connection Status page allows you to verify the NMSP connection between the mobility services engine and the Cisco controller to which the mobility services engine is assigned.

Note Network Mobility Services Protocol (NMSP) is the protocol that manages communication between the mobility service and the controller.

To verify the NMSP connection between the controller and the mobility services engine, follow these steps:

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

Step 2 Click the name of the applicable mobility service.

Step 3 From the left sidebar menu, choose **System > Status > NMSP Connection Status**.

The NMSP Connection Status page shows the following information:

- Summary—The Summary section shows each device type, the total number of connections, and the number of inactive connections.
- NMSP Connection Status—This group box shows the following:
  - IP address—Click the device IP address to view NMSP connection status details for this device. See the "Viewing NMSP Connection Status Details" section on page 16-41 for additional information.
  - Target Type—Indicates the device to which the NMSP connection is intended.
  - Version—Indicates the current software version for the device.
  - NMSP Status—Indicates whether the connection is active or inactive.
  - Echo Request Count—Indicates the number of echo requests that were sent.
  - Echo Response Count—Indicates the number of echo responses that were received.
  - Last Message Received—Indicates the date and time of the most recent message received.

Step 4 Verify that the NMSP Status is ACTIVE.

- If active, you can view details on wired switches, controllers, and wired clients.
- If not active, resynchronize the NCS device and the mobility services engine.

Note You can launch an NMSP troubleshooting tool for an inactive connection.

Viewing NMSP Connection Status Details

To view NMSP Connection Status details, follow these steps:

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

Step 2 Click the name of the applicable mobility service.

Step 3 From the left sidebar menu, choose **System > Status > NMSP Connection Status**.

Step 4 Click the device IP address to open the NMSP Connection Status Details page. The Details page shows the following information:

- Summary
  - IP Address
  - Version—The current software version for the device.
  - Target Type—The device to which the NMSP connection is intended.
  - NMSP Status—Indicates whether the connection is active or inactive.
  - Echo Request Count—The number of echo requests that were sent.
  - Echo Response Count—The number of echo responses that were received.
  - Last Activity Time—The date and time of the most recent message activity between the device and the mobility services engine.
  - Last Echo Request Message Received At—The date and time the last echo request was received.
  - Last Echo Response Message Received At—The date and time the last echo response was received.
  - Model—The device model.
  - MAC Address—The MAC address of the device, if applicable.
  - Capable NMSP Services—Indicates the NMSP-capable services for this device such as ATTACHMENT or LOCATION.
- Subscribed Services—Indicates subservices for each subscribed NMSP service. For example, MOBILE_STATION_ATTACHMENT is a subservice of ATTACHMENT.
- Messages
  - Message Type—Message types might include: ATTACHMENT_NOTIFICATION, ATTACHMENT_REQUEST, ATTACHMENT_RESPONSE, CAPABILITY_NOTIFICATION, ECHO_REQUEST, ECHO_RESPONSE, LOCATION_NOTIFICATION, LOCATION_REQUEST, SERVICE_SUBSCRIBE_REQUEST, SERVICE_SUBSCRIBE_RESPONSE.
  - In/Out—Indicates whether the message was an incoming or outgoing message.
  - Count—Indicates the number of incoming or outgoing messages.
  - Last Activity Time—The date and time of the most recent activity or message.
  - Bytes—Size of the message in Bytes.

Managing Maintenance for Mobility Services

This section contains the following topics:

- Restoring Mobility Services Engine Historical Data, page 16-44
- Downloading Software to a Mobility Services Engine Using NCS, page 16-44

Viewing or Editing Mobility Services Backup Parameters

To view or edit mobility service backup parameters, follow these steps:

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

Step 2 Click the name of the mobility service whose properties you want to edit.

Step 3 From the left sidebar menu, choose **Maintenance > Backup**.

- Backups located at—Indicates the location of the backup file.
- Enter a name for the Backup—Enter or edit the name of the backup file.
- Timeout (in secs)—Indicates the length of time (in seconds) before attempts to back up files times out.

Backing Up Mobility Services Engine Historical Data

NCS contains functionality for backing up mobility services engine data.

To back up mobility services engine data, follow these steps:

Step 1 In NCS, click **Services > Mobility Services**.

Step 2 Click the name of the mobility services engine that you want to back up.

Step 3 From the left sidebar menu, choose **Maintenance > Backup**.

Step 4 Enter the name of the backup.

Step 5 Enter the time in seconds after which the backup times out.

Step 6 Click **Submit** to back up the historical data to the hard drive of the server running NCS.

Status of the backup can be seen on the page while the backup is in process. Three items are displayed on the page during the backup process: (1) Last Status field provides messages noting the status of the backup; (2) Progress field shows what percentage of the backup is complete; and (3) Started at field shows when the backup began noting date and time.

Note You can run the backup process in the background while working on other mobility services engine operations in another NCS page.

Note Backups are stored in the FTP directory that you specify during the NCS installation. However, in the NCS installation, the FTP directory is not specified. It might be necessary to provide the full path of the FTP root.

Restoring Mobility Services Engine Historical Data

To restore a file back into the mobility service, follow these steps:

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

Step 2 Click the name of the mobility service whose properties you want to edit.

Step 3 From the left sidebar menu, choose **Maintenance > Restore**.

Step 4 Choose the file to restore from the drop-down list.

Step 5 Select the **Delete synchronized service assignments** check box if you want to permanently remove all service assignments from the mobility services engine.

This option is applicable for network designs, wired switches, controllers and event definitions. The existing location history data is retained, however you must use manual service assignments to perform any future location calculations.

Step 6 Click **Submit** to start the restoration process.

Step 7 Click **OK** to confirm that you want to restore the data from the NCS server hard drive.

When the restoration is complete, NCS shows a message to that effect.

Note You can run the restore process in the background while working on other mobility services engine operations in another NCS page.

Downloading Software to a Mobility Services Engine Using NCS

To download software to a mobility services engine using NCS, follow these steps:

Step 1 Verify that you can ping the location appliance from NCS or an external FTP server, whichever you are going to use for the application code download.

Step 2 Choose **Services > Mobility Services**.

Step 3 Click the name of the mobility services engine to which you want to download software.

Step 4 On the left sidebar menu, choose **Maintenance**.

Step 5 Click *Download Software*.

To download software, do one of the following:

- To download software listed in the NCS directory, select the *Select from uploaded images to transfer into the Server* check box. Then, choose a binary image from the drop-down list.

  NCS downloads the binary images listed in the drop-down list into the FTP server directory you specified during the NCS installation.

  In NCS installation, FTP directory is not specified. It might be necessary to give the full path of the FTP root.

- To use downloaded software available locally or over the network, select the **Browse a new software image to transfer into the Server** check box and click **Browse**. Locate the file and click **Open**.

Step 6 Enter the time, in seconds (between 1 and 1800), after which the software download times out.

Step 7 Click **Download** to send the software to the /opt/installers directory on the mobility services engine.

Managing Cisco Adaptive wIPS Service Parameters

The wIPS Service page allows you to view or manage wIPS service administrative settings.

Note Cisco Adaptive wIPS functionality is not supported for non-root partition users.

Managing wIPS Service Administration Settings

To view or manage wIPS service administration settings, follow these steps:

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

Step 2 Choose the device name of the applicable mobility services engine.

Step 3 From the left sidebar menu, choose **wIPS Service**.

Step 4 View or edit the following parameters:

- Log level—Choose the applicable log level from the drop-down list. Log levels include debug, error, important event, major debug, none, and warning.
- Forensic size limit (GB)—Enter the maximum allowable size of forensic files.
- Alarm ageout (hours)—Enter the age limit, in hours, for each alarm.
- Device ageout (days)—Enter the age limit, in days, for the device to send alarms.

Step 5 Click **Save** to confirm the changes or **Cancel** to close the page with no changes applied.

Managing Context-Aware Service Software Parameters

Context-Aware Service (CAS) software allows a mobility services engine to simultaneously track thousands of mobile assets and clients by retrieving contextual information such as location, temperature and asset availability about a client or tag (Cisco CX version or later) from Cisco access points.

CAS relies on two engines for processing the contextual information it receives. The *Context-Aware Engine for Clients* processes data received from Wi-Fi clients and the *Context-Aware Engine for Tags* processes data received from Wi-Fi tags; these engines can be deployed together or separately depending on the business need.

Note Mobility services engines do not track or map non-Cisco CX tags.

Note CAS was previously referred to as Cisco location-based services.

You can modify Context-Aware Service Software properties as to 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 Received Signal Strength Indicator (RSSI) measurements.

Viewing Contextual Information

Before you can use NCS to view contextual information, initial configuration for the mobility services engine is required using a command-line interface (CLI) console session. See the *Cisco 3350 Mobility Services Engine Getting Started Guide* and the *Cisco 3100 Mobility Services Engine Getting Started Guide* at the following URL: http://www.cisco.com/en/US/products/ps9742/tsd_products_support_series_home.html.

After its installation and initial configuration are complete, the mobility services engine can communicate with multiple Cisco wireless LAN controllers to collect operator-defined contextual information. You can then use the associated NCS to communicate with each mobility services engine to transfer and display selected data.

You can configure the mobility services engine to collect data for clients, rogue access points, rogue clients, mobile stations, interferers, and active RFID asset tags.

Licensing for Clients and Tags

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 contains tracking of rogue clients and rogue access points, and interferers (if enabled).
- Licenses for tags and clients are offered in a variety of quantities, ranging from 1,000 to 12,000 units.

  The AeroScout Context-Aware Engine for Tags support 100 permanent tag licenses; Context-Aware Services consists of permanent tag licenses.

Note See the *Release Notes for Cisco 3300 Series Mobility Services Engine for Software Release 6.0* at the following URL: http://www.cisco.com/en/US/products/ps9742/tsd_products_support_series_home.html for more information on tags and client licenses.

For additional information on Context-Aware parameters, select one of the following topics:

- Context-Aware Service General Parameters, page 16-46
- Context-Aware Service Administration Parameters, page 16-47
- Context-Aware Service Advanced Parameters, page 16-64

Context-Aware Service General Parameters

To access the Context Aware Service > General page, choose **Services > Mobility Services > General** from the left sidebar menu. This page provides the following information:

- Number of tracked clients
- Number of traced tags
- Number of tracked rogues

- Number of tracked interferers
- Number of tracked wired clients
- Limit for total elements tracked
- Limit for number of tracked tags
- Interactive graph of the mobility services engine client and tag count

Context-Aware Service Administration Parameters

This section contains the following topics:

Modifying Tracking Parameters for Mobility Services

The mobility services engine can track up to18,000 clients or up to18,000 tags (with the proper license purchase). Updates on the locations of elements being tracked are provided to the mobility services engine from the Cisco wireless LAN controller.

Only those elements designated for tracking by the controller are viewable in NCS 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 NCS:

- Enable and disable element locations (client stations, active asset tags, interferers, wired clients, rogue clients, and rogue access points) 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 specific elements 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 track 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.
- Disable tracking and reporting of ad hoc rogue clients and access points.

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

Step 1 Choose **Services > Mobility Services** to open the Mobility Services page.

Step 2 Click the name of the mobility services engine whose properties you want to edit. The General Properties page opens.

Step 3 In the Context-Aware Software menu located on the left sidebar menu, choose **Tracking Parameters** from the Administration subheading to display the configuration options.

Step 4 Modify the following tracking parameters as appropriate (see Table 16-5).

Table 16-5 Tracking Parameters

Field	Configuration Options
Tracking Parameters	
Wired Clients	1. Select the **Enable** check box to enable tracking of client stations by the mobility services engine. In 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 NCS 1.0. In other words, you can limit wired clients to a fixed number, say 500. This limit is set to ensure that the licenses are not taken up completely by wired clients and some licenses are available for other devices. **Caution** When upgrading the mobility services engine from 6.0 to 7.0, if any limits have been set on wireless clients or rogues, they reset because of the wired client limit change in 7.0. **Note** Active Value (Display only): Indicates the number of wired client stations currently being tracked. **Note** Not Tracked (Display only): Indicates the number of wired client stations beyond the limit.
Wireless Clients	1. Select the **Enable** check box to enable tracking of client stations by the mobility services engine. 2. Select the **Enable Limiting** check box to set a limit on the number of client stations to track. 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. **Note** The actual number of tracked clients is determined by the license purchased. **Note** Active Value (Display only): Indicates the number of client stations currently being tracked. **Note** Not Tracked (Display only): Indicates the number of client stations beyond the limit.

Table 16-5 Tracking Parameters (continued)

Field	Configuration Options
Rogue Access Points	1. Select the **Enable** check box to enable tracking of rogue clients and asset points by the mobility services engine. 2. Select the **Enable Limiting** check box to set a limit on the number of rogue clients and asset tags stations to track. 3. Enter a Limit Value, if limiting is enabled. The limit entered can be any positive value up to18,000 which is the maximum number of rogue clients and access points that can be tracked by a mobility services engine. **Note** The actual number of tracked rogues (clients and access points) is driven by the client license purchased. The user must consider the number of clients that are being tracked in determining the available quantity to allocate to track rogue clients and access points because clients and rogue clients and access points are addressed by the same license. **Note** Active Value (Display only): Indicates the number of rogue clients and access points currently being tracked. **Note** Not Tracked (Display only): Indicates the number of rogue clients and access points beyond the limit.
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 NCS maps or its events and alarms reported.
Rogue Clients	1. Select the **Enable** check box to enable tracking of rogue clients by the mobility services engine. 2. Select the **Enable Limiting** check box to set a limit on the number of rogue clients to track. 3. Enter a Limit Value, if limiting is enabled. The limit entered can be any positive value up to18,000 which is the maximum number of rogue clients that can be tracked by a mobility services engine. **Note** The actual number of tracked rogues (clients and access points) is driven by the client license purchased. The user must consider the number of clients that are being tracked in determining the available quantity to allocate to track rogue clients and access points because clients and rogue clients and access points are addressed by the same license. **Note** Active Value (Display only): Indicates the number of rogue clients being tracked. **Note** Not Tracked (Display only): Indicates the number of rogue clients beyond the limit.

Table 16-5 Tracking Parameters (continued)

Field	Configuration Options
Interferers	1. Select the **Enable** check box to enable tracking of the interferers by the mobility services engine. In 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. **Note** Active Value (Display only): Indicates the number of interferers currently being tracked. **Note** Not Tracked (Display only): Indicates the number of interferers beyond the limit.
Asset Tracking Elements	
Active RFID Tags	1. Select the **Enable** check box to enable tracking of active RFID tags by the mobility services engine. **Note** The actual number of tracked active RFID tags is determined by the license purchased. **Note** Active Value (Display only): Indicates the number of active RFID tags currently being tracked. It also depends on the tag engine chosen. **Note** Not Tracked (Display only): Indicates the number of active RFID tags beyond the limit.
SNMP Parameters Not applicable to mobility services 7.0.105.0 and later.	
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 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 only.)
SNMP Polling Interval	
Client Stations	Select the **Enable** check box to enable client station polling and enter the polling interval in seconds. Default value is 300. Allowed values are from 1 to 99999. (Configurable in controller release 4.1 and earlier only.)
Active RFID Tags	Select the **Enable** check box to enable active RFID tag polling and enter the polling interval in seconds. Allowed values are from 1 to 99999. **Note** Before the mobility service can collect asset tag data from controllers, you must enable the detection of active RFID tags using the **config rfid status enable** CLI command on the controllers.
Rogue Clients and Access Points	Select the **Enable** check box to enable rogue access point polling and enter the polling interval in seconds. Default value is 600. Allowed values are from 1 to 99999.(Configurable in controller release 4.1 and earlier only.)
Statistics	Select the **Enable** check box to enable statistics polling for the mobility service, and enter the polling interval in seconds. Default value is 900. Allowed values are from 1 to 99999.(Configurable in controller release 4.1 and earlier only.)

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

Filtering Parameters for Mobility Services

In NCS, you can limit the number of asset tags, wired clients, rogue clients, interferers and access points whose location is tracked by filtering on the following:

- 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 NCS GUI page.

  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 as follows:

  - Each MAC address should be listed on a single 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 Allowed listing that follows is a wildcard.

Note Allowed MAC address formats are viewable in the Filtering Parameters configuration page. See Table 16-6 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 to another controller but whose probing activity causes them to be seen by another controller and be counted as an element by the "probed" controller as well as its primary controller.

Modifying Filtering Parameters

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

Step 1 Choose **Services > Mobility Services**. 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 From the Context-Aware Software menu, choose **Filtering Parameters** from the Administration subheading to display the configuration options.

Step 4 Modify the following filtering parameters as appropriate (see Table 16-6).

Table 16-6 Filtering Parameters

Field	Configuration Options
Exclude Probing Clients	Select the check box to prevent location calculation of probing clients.
Enable Location MAC Filtering	1. Select the check box to enable MAC filtering of specific elements by their MAC address. 2. To import a file of MAC addresses (Upload a file for Location MAC Filtering field), browse for the filename and click **Save** to load the file. The imported list of MAC addresses auto-populates the Allowed List and Disallowed List based on their designation in the file. **Note** To view allowed MAC address formats, click the red question mark next to the Upload a file for Location MAC Filtering field. 3. To add an individual MAC address, enter the MAC addresses (format is xx:xx:xx:xx:xx:xx) and click either **Allow** or **Disallow**. The address appears in the appropriate column. **Note** To move an address between the Allow and Disallow columns, highlight the MAC address entry and click the button under the appropriate column. **Note** To move multiple addresses, click the first MAC address and press **Ctrl** to highlight additional MAC addresses. Click **Allow** or **Disallow** based on its desired destination. **Note** If a MAC address is not listed in the Allow or Disallow column, by default, it appears in the Blocked MACs column. If you click the **Unblock** button, the MAC address automatically moves to the Allow column. You can move it to the Disallow column by selecting the Disallow button under the Allow column.

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

Modifying History Parameters for Mobility Services

You can use NCS to specify how long to store (archive) histories on client stations, rogue clients, and asset tags. These histories are received from those controllers that are associated with the mobility service.

You can also program the mobility service to periodically remove (prune) duplicate data from its historical files to reduce the amount of data stored on its hard drive.

To configure mobility service history settings, follow these steps:

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

Step 2 Click the name of the mobility service whose properties you want to edit.

Step 3 From the left sidebar menu, choose **Context Aware Service > History Parameters**.

Step 4 Modify the following history parameters as appropriate (see Table 16-7).

Table 16-7 History Parameters

:

Field	Description
Archive for	Enter the number of days for the location appliance to retain a history of each enabled category. The default value is 30. Allowed values are from 1 to 99999.
Prune data starting at	Enter the number of hours and minutes at which the location appliance starts data pruning (between 0 and 23 hours, and between 1 and 59 minutes). Enter the interval in minutes after which data pruning starts again (between 0, which means never, and 99900000). The default start time is 23 hours and 50 minutes, and the default interval is 1440 minutes.
Enable History Logging of Location Transitions for	To enable history logging of Location transitions, choose one or more of the following: • Client Stations • Wired Stations • Asset Tags • Rogue Clients • Rogue Access Points • Interferers **Note** Before the mobility service can collect asset tag data from controllers, you must enable the detection of RFID tags using the **config rfid status enable** CLI command.

Step 5 Click **Save** to store your selections in the location appliance database.

Enabling Location Presence for Mobility Services

You can enable location presence on the mobility services engine to provide expanded Civic (city, state, postal code, country) and GEO (longitude, latitude) location information beyond the Cisco default setting (campus, building, floor, and X, Y coordinates). This information can then be requested by wireless and wired clients on a demand basis 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.

Location Presence can be configured when a new Campus, Building, Floor or Outdoor Area is being added or configured at a later date.

Once enabled, the mobility services engine is capable of providing any requesting Cisco CX v5 client its location.

Note Before enabling this feature, synchronize the mobility services engine.

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

Step 1 Choose **Services > Mobility Services >** *Device Name*. Select the mobility services engine to which the campus or building or floor is assigned.

Step 2 From the left sidebar menu, choose **Context Aware Services > Administration > Presence Parameters**.

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:

a. Select the **Cisco** check box to provide location by campus, building and floor and X and Y coordinates. 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.

Note See the "Importing Civic Information for Mobility Services" section on page 16-56 for more information on importing a file with multiple Civic listings.

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 Asset Information for Mobility Services

To import asset, chokepoint, and TDOA receiver information for the mobility services engine using NCS, follow these steps:

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

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 When the import filename is located in the Browse text box, click **Import**.

Exporting Asset Information for Mobility Services

To export asset, chokepoint, and TDOA receiver information from the mobility services engine to a file using NCS, follow these steps:

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

Step 2 Click the name of the mobility services engine from which you want the 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**.

Click **Open** (display to screen), **Save** (to external PC or server), or **Cancel** (to cancel the request).

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

Importing Civic Information for Mobility Services

To import civic information for the mobility services engine using NCS, follow these steps:

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

Step 2 Click the name of the mobility services engine for which you want to import asset information.

Step 3 From the left sidebar menu, choose **Context Aware Software**.

Step 4 From the Administration left sidebar menu, choose **Import Civic Information**.

Step 5 Enter the name of the text file or browse for the filename.

Information in the imported file should be one of the following formats:

Switch IP Address, Slot Number, Port Number, Extended Parent Civic Address, X, Y, Floor ID, Building ID, Network Design ID, ELIN:"ELIN", PIDF-Lo-Tag:"Civic Address Element Value"

Note Each entry must appear on a separate line.

Step 6 Click **Import**.

Context-Aware Service Wired Parameters

This section describes the Context Aware Service > Wired drop-down list parameters and contains the following topics:

Monitoring Wired Switches

You can review details on the wired switch (IP address, MAC address, serial number, software version, and ELIN), its port, its wired clients (count and status), and its civic information.

Wired switch data is downloaded to the mobility services engine through NCS when the Ethernet switch and the mobility services engine are synchronized (Services > Synchronize Services > Switches). Communication between a location-capable switch and the mobility services engine is over NMSP. NCS and the mobility services engine communicate over XML.

To view details on wired switches, follow these steps:

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

Step 2 In the Mobility Services page, click the device name link of the appropriate wired location switch.

Step 3 Choose **Context Aware Service > Wired > Wired Switches**. A summary of wired switches that are synchronized with the mobility services engine appears.

Step 4 See the "Wired Switch Details" section on page 16-57 for more information on the switch, its port, its wired clients (count and status), and its civic information click the IP address link.

Wired Switch Details

To view wired switch details, follow these steps:

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

Step 2 In the Mobility Services page, click the device name link of the appropriate mobility services engine.

Step 3 Choose **Context Aware Service > Wired > Wired Switches**. A summary of wired switches that are synchronized with the mobility services engine appears.

Step 4 Click the IP address link for the applicable wired switch. The Wired Switch Details page opens.

The Wired Switch Details page has four tabs: Switch Information, Switch Ports, Civic, and Advanced.

Note You can export civic information from the switch by choosing that option from the Select a command drop-down list. This option is available in all four dashlets of the Wired Switches page.

The Wired Switch Details tabs shows the following information:

- Switch Information—Displays a total count summary of wired clients connected to the switch along with the state of the client (connected, disconnected, and unknown).
  - Connected clients—Clients that are connected to the wired switch.
  - Disconnected clients—Clients that are disconnected from the wired switch.
  - Unknown clients—Clients are marked as unknown when the NMSP connection to the wired switch is lost.

  Note You can view detailed wired client information by clicking in one of the client count links (total clients, connected, disconnected, and unknown). See the "Monitoring Wired Clients" section on page 16-58 section for more information.

- Switch Ports—Displays a detailed list of the ports on the switch.

  Note You can change the listing order (ascending, descending) of port IP addresses, slot numbers, module number, port type, and port number by clicking in the respective column heading.

- Civic—Displays a detailed list of the civic information for the wired switch.

- Advanced—Displays a detailed list of the additional civic information for the wired switch.

Monitoring Wired Clients

You can view details on a wired client (MAC address, IP address, username, serial number, UDI, model no., software version, VLAN ID, and VLAN ID), port association, and its civic information.

Wired client data is downloaded to the mobility services engine through NCS when the switch and the mobility services engine are synchronized (Services > Synchronize Services > Switches).

NCS and the mobility services engine communicate over XML.

You can view the details of the wired client on either the wired switches page (Context Aware Service > Wired > Wired Switches) or wired clients page (Context Aware Service > Wired > Wired Clients).

- If you know the IP address, MAC address, VLAN ID, serial number, or username, you can use the search field on the wired clients page.
- If you want to examine wired clients as they relates to a specific switch, you can view that information on the wired switches page. See the "Monitoring Wired Switches" section on page 16-56 section for more information.

To view details on a wired client, follow these steps:

Step 1 Choose **Services > Mobility Services**. The Mobility Services page opens.

Step 2 Click the device name link of the appropriate wired location switch.

Step 3 Choose **Context Aware Service > Wired > Wired Clients**.

In the Wired Clients summary page, clients are grouped by their switch.

A client status is noted as connected, disconnected, or unknown:

- Connected clients—Clients that are active and connected to a wired switch.
- Disconnected clients—Clients that are disconnected from the wired switch.
- Unknown clients—Clients that are marked as unknown when the NMSP connection to the wired switch is lost. See the "Viewing NMSP Connection Status for a Mobility Services Engine" section on page 16-41 for more information about NMSP connections.

If you know the MAC address of the wired client, you can click that link to reach the detail page of the client or use the search field. See the "Wired Client Details" section on page 16-58 for more information on wired client details.

- You can also search for a wired client by its IP address, username, or VLAN ID.

If you click the IP address of the switch, you are forwarded to the detail page of the switch. See the "Monitoring Wired Switches" section on page 16-56 section for more information.

Step 4 Click the MAC Address for the applicable client to view wired client details. See the "Wired Client Details" section on page 16-58 for more information on wired client details.

Wired Client Details

To view wired client details, follow these steps:

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

Step 2 In the Mobility Services page, click the device name link of the appropriate mobility services engine.

Step 3 Choose **Context Aware Service > Wired > Wired Clients**. A summary of wired clients that are synchronized with the mobility services engine appears.

Step 4 Click the MAC address link for the applicable wired client. The Wired Client Details page opens.

The Wired Client Details page has four tabs: Device Information, Port Association, Civic Address, and Advanced.

The Wired Switch Details tabs show the following information:

- Device Information—Display MAC and IP address, username, serial and model number, UDI, software version, VLAN ID, and VLAN name.
- Port Association—Displays the physical location of the switch port/slot/module on which the wired client terminates, the client status (connected, disconnected, unknown), and the switch IP address.
- Civic Address—Displays any civic address information.
- Advanced—Displays extended physical address details for the wired clients, if applicable.

Note A client takes on the civic address and advanced location information that is configured for the port on which the client terminates. If no civic and advanced information is defined for the its port (port/slot/module) then no location data is displayed.

Monitoring Interferers

The Monitor > Interferers page allows you to monitor interference devices detected by the CleanAir enabled access points.

This section provides information on the interferers detected by the CleanAir enabled access points. By default, the Monitor > Interferers > AP Detected Interferers, page 16-59 page is displayed.

This section contains the following topics:

Monitor > Interferers > AP Detected Interferers

Choose **Monitor > Interferers** to view all the interfering devices detected by the CleanAir enabled access points on your wireless network. This page enables you to view a summary of the interfering devices including the following default information:

- Interferer ID—A unique identifier for the interferer. Click this link to know more about the interferer.
- Type—Indicates the category of the interferer. Click to read more about the type of device. The dialog box appears displaying more details. The categories include the following:
  - Bluetooth link—A Bluetooth link (802.11b/g/n only)
  - Microwave Owen—A microwave oven (802.11b/g/n only)

  - 802.11 FH—An 802.11 frequency-hopping device (802.11b/g/n only)
  - Bluetooth Discovery—A Bluetooth discovery (802.11b/g/n only)
  - TDD Transmitter—A time division duplex (TDD) transmitter
  - Jammer—A jamming device
  - Continuous Transmitter—A continuous transmitter
  - DECT-like Phone—A digital enhanced cordless communication (DECT)-compatible phone
  - Video—A video camera
  - 802.15.4—An 802.15.4 device (802.11b/g/n only)
  - WiFi Inverted—A device using spectrally inverted Wi-Fi signals
  - WiFi Invalid—A device using non-standard Wi-Fi channels
  - SuperAG—An 802.11 SuperAG device
  - Canopy—A Motorola Canopy device
  - Radar—A radar device (802.11a/n only)
  - XBox—A Microsoft Xbox (802.11b/g/n only)
  - WiMAX Mobile—A WiMAX mobile device (802.11a/n only)
  - WiMAX Fixed—A WiMAX fixed device (802.11a/n only)
  - TDD Exalt
  - Motorola Canopy
- Status—Indicates the status of the interfering device.
  - Active—Indicates that the interferer is currently being detected by the CleanAir-enabled access point.
  - Inactive—Indicates that the interferer is no longer being detected by the CleanAir-enabled access point or the CleanAir-enabled access point determined that the interferer is no longer reachable by NCS.
- Severity—Displays the severity ranking of the interfering device.
- Affected Band—Displays the band in which this device is interfering.
- Affected Channels—Displays the affected channels.
- Duty Cycle (%)—The duty cycle of interfering device in percentage.
- Discovered—Displays the time at which it was discovered.
- Last Updated—The last time the interference was detected.
- Floor—The location where the interfering device is present.

Note These devices appear only if the option to track Interferers is enabled in the Tracking Parameters page. This option is disabled by default. See the "Modifying Tracking Parameters for Mobility Services" section on page 16-47 for more information on tracking parameters.

Monitor > Interferers > AP Detected Interferers > Interferer Details

Choose **Monitor > Interferers >** *Interferer ID* to view this page. This page enables you to view the details of the interfering devices detected by the access points. This page provides the following details about the interfering device.

- Interferer Properties
  - Type—Displays the type of the interfering device detected by the AP.
- Status—The status of the interfering device. Indicates the status of the interfering device.
  - Active—Indicates that the interferer is currently being detected by the CleanAir enabled access point.
  - Inactive—Indicates that the interferer is no longer being detected by the CleanAir enabled access point or the CleanAir enabled access point saw the interferer no longer reachable by NCS.
  - Severity—Displays the severity ranking of the interfering device.
  - Duty Cycle (%)—The duty cycle of interfering device in percentage.
  - Affected Band—Displays the band in which this device is interfering.
  - Affected Channels—Displays the affected channels.
  - Discovered—Displays the time at which it was discovered.
  - Last Updated—The last time the interference was detected.
- Location
  - Floor—The location where this interfering device was detected.
  - Last Located At—The last time where the interfering device was located.
  - On MSE—The Mobility Server Engine on which this interference device was located.
- Clustering Information
  - Clustered By—Displays the following:

    IP address of the controller if clustered by a controller.

    IP address of the mobility services engine if clustered by a mobility services engine.
  - Detecting APs—Displays the details of the access point that has detected the interfering device. The details include: Access Point Name (Mac), Severity, and Duty Cycle(%).

Note The detecting access point information is available only for active devices. And even for some active devices, this information might not be available. This is because these interferers are in the process of being marked inactive and in the next refresh of Monitor > Interferers page, these appear as inactive.

- Details—Displays a short description about the interfering type.

Select a command

The Select a command drop-down list provides access to the location history of the interfering device detected by the access point. See the "Monitor > Interferers > AP Detected Interferer Details > Interference Device ID > Location History" section on page 16-62 for more information.

Monitor > Interferers > AP Detected Interferer Details > Interference Device ID > Location History

Choose **Monitor > Interferers >** *Interference Device ID*, choose **Location History** from the Select a command drop-down list, and click **Go** to view this page.

- Interferer Information—Displays the basic information about the interfering device.
  - Data Collected At—The time stamp at which the data was collected.
  - Type—The type of the interfering device.
  - Severity—The severity index of the interfering device.
  - Duty Cycle—The duty cycle (in percentage) of the interfering device.
  - Affected Channels—A comma separated list of the channels affected.
- Interferer Location History—Displays the location history of the interfering devices.
  - Time Stamp
  - Floor
- Clustering Information
  - Clustered By
- Detecting APs
  - AP Name—The access point that detected the interfering device.
  - Severity—The severity index of the interfering device.
  - Duty Cycle(%)—The duty cycle (in percentage) of the interfering device.
- Location
  - Location Calculated At—Displays the time stamp at which this information was generated.
  - Floor—Displays location information of the interfering device.
  - A graphical view of the location of the interfering device is displayed in a map. Click the **Enlarge** link to view an enlarged image.

Monitor > Interferers > Edit View

The Edit View page allows you to add, remove, or reorder columns in the AP Detected Interferers Summary page. It also allows you to search for Interferers. By default, only those interferers that are in Active state and with a severity greater than or equal to 5 are displayed in the AP Detected Interferers page. See the "Monitor > Interferers > Edit View > Edit Search" section on page 16-63 for more information on editing search criteria.

To edit the columns in the AP Detected Interferers page, follow these steps:

Step 1 Choose **Monitor > Interferers**. The AP Detected Interferers page appears showing details of the interferers detected by the CleanAir-enabled access points.

Step 2 Click the **Edit View** link in the AP Detected Interferers page.

Step 3 To add an additional column to the access points table, click to highlight the column heading in the left column. Click **Show** to move the heading to the right column. All items in the right column are displayed in the table.

Step 4 To remove a column from the access points table, click to highlight the column heading in the right column. Click **Hide** to move the heading to the left column. All items in the left column are not displayed in the table.

Step 5 Use the **Up/Down** buttons to specify the order in which the information appears in the table. Highlight the desired column heading and click **Up** or **Down** to move it higher or lower in the current list.

Step 6 Click **Reset** to restore the default view.

Step 7 Click **Submit** to confirm the changes.

Monitor > Interferers > Edit View > Edit Search

You can search for interferers based on certain criteria. By default only those interferers that are in Active state and with severity greater than or equal to 5 are displayed in the AP Detected Interferers page. Use the Edit Search option to customize the interferer search.

To edit the search criteria, follow these steps:

Step 1 Choose **Monitor > Interferers**. The AP Detected Interferers page appears.

Step 2 Click **Edit Search** and select the appropriate criteria. This option allows you to specify the following search criteria:

- Search Category—For interferer search, the search category is Interferers.
- Detected By—From the drop-down list, choose **Access Points** or **Spectrum Experts**.
- Search By—From the list box, choose any one of the following options:
  - **All Interferers**
  - **Interferer ID**
  - **Interferer Type**
  - **Severity**
  - **Duty Cycle**
  - **Location**
- Severity greater than—Enter the severity level in the text box.
- Detected within the last—From the list box, choose any one of the following options:
  - **5 Minutes**
  - **15 Minutes**
  - **30 Minutes**
  - **1 Hour**
  - **3 Hours**
  - **6 Hours**
  - **12 Hours**
  - **24 Hours**
  - **All History**
- Interferer status—From the list, choose any of the following options:
  - **Active**
  - **Inactive**
  - **All**

- Restrict By Radio Band/Channels—Select this check box if you want to restrict certain radio frequencies or channels from the search. By default, this check box is unselected. On selection of this check box, a list appears with 2.4-GHz, 5-GHz and Individual Channel options. If you select Individual Channel, an Affected Channels text box appears. Specify the channel and select either the **Match All** or **Match Any** radio button.

Step 3 Select the number of items per page that you want to view in the search results.

Step 4 Select the **Save Search** check box if you want to save the search.

Step 5 After specifying the search criteria. Click **Go** to view the search results.

Context-Aware Service Advanced Parameters

This section contains the following topics:

Modifying Location Parameters for Mobility Services

You can use NCS to specify whether the mobility service retains its calculation times and how soon the mobility service deletes its collected Received Signal Strength Indicator (RSSI) measurement times. You can also apply varying smoothing rates to manage location movement of an element.

To configure location parameters, follow these steps:

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

Step 2 Click the name of the mobility service whose properties you want to edit.

Step 3 From the left sidebar menu, choose **Context Aware Service > Location Parameters**.

Step 4 Modify the location parameters as appropriate (see Table 16-8).

Table 16-8 Location Parameters

Field	Description
General	
Enable Calculation Time	Select the check box to enable the calculation of the time required to compute location. **Caution** Enable only under Cisco TAC personnel guidance because enabling this field slows down overall location calculations.

Table 16-8 Location Parameters (continued)

Field	Description
Enable OW Location	Select the check box to enable Outer Wall (OW) calculation as part of location calculation. **Note** The OW Location parameter is ignored by the location server.
Relative discard RSSI time	Enter the number of minutes since the most recent RSSI sample after which RSSI measurement should be considered stale and discarded. Default value is 3. Allowed values range from 0 to 99999. A value of less than 3 is not recommended.
Absolute discard RSSI time	Enter the number of minutes after which RSSI measurement should be considered stale and discarded, regardless of the most recent sample. Default value is 60. Allowed values range from 0 to 99999. A value of less than 60 is not recommended.
RSSI Cutoff	Enter the RSSI cutoff value, in decibels (dBs) with respect to one (1) mW (dBm), preceding which the mobility service always use the access point measurement. Default value is -75. **Note** When 3 or more measurements are available preceding the RSSI cutoff value, the mobility service discards any weaker values and use the 3 (or more) strongest measurements for calculation; however, when only weak measurements following the RSSI cutoff value are available, those values are used for calculation. **Caution** Modify only under Cisco TAC personnel guidance. Modifying this value can reduce the accuracy of location calculation.
Enable Location Filtering	If enabled, the location filter is applied only for client location calculation. Enabling location filter allows previous location estimates to be used in estimating current location. This reduces location jitter for stationary clients and improve tracking for mobile clients.

Table 16-8 Location Parameters (continued)

Field	Description
Chokepoint Usage	Select the check box to enable the usage of chokepoint proximity to determine location. Applies to Cisco compatible Tags capable of reporting chokepoint proximity.
Use Chokepoints for Interfloor conflicts	Allows the use of chokepoints to determine the correct floor during Interfloor conflicts. Choose **Never**, **Always**, or **Floor Ambiguity**.
Chokepoint Out of Range Timeout	After a Cisco compatible Tag leaves a chokepoint proximity range, this is the timeout (in seconds) after which RSSI information is used again to determine location.
Absent Data Cleanup Interval	Enter the interval period (in minutes) for removing inactive elements from the database.
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.
Movement Detection	
Individual RSSI change threshold	This field specifies the Individual RSSI movement recalculation trigger threshold. Enter a threshold value between 0-127 dBm. Donot modify without Cisco TAC guidance.
Aggregated RSSI change threshold	This field specifies the Aggregated RSSI movement recalculation trigger threshold. Enter a threshold value between 0-127 dBm. It should not be modified without Cisco TAC guidance.
Many new RSSI change percentage threshold	This field specifies Many new RSSI movement recalculation trigger threshold in percentage. It should not be modified without Cisco TAC guidance.
Many missing RSSI percentage threshold	This field specifies Many missing RSSI movement recalculation trigger threshold in percentage. It should not be modified without Cisco TAC guidance.

Step 5 Click **Save** to store your selections in the NCS and mobility service databases.

Modifying Notification Parameters for Mobility Services

You can use NCS to configure mobility services engine event notification parameters that define such items as how often the notifications are generated or resent by the mobility services engine.

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

You can also enable forwarding of northbound notifications for tags to be sent to third-party applications.

The format of northbound notifications sent by the mobility services engine is available on the Cisco developers support portal at the following URL:

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

To configure notification parameters, follow these steps:

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

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

Step 3 From the Context Aware Software left sidebar menu, choose **Notification Parameters** from the Advanced sub-heading 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 content options:

- 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 trigger options:

- Chokepoints
- Telemetry
- Emergency
- Battery Level
- Vendor Data
- Location Recalculation

Step 9 Enter the IP address 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 **HTTPS** 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 the page. Table 16-9 describes each parameter.

Table 16-9 User-Configured Conditional and Northbound Notifications Parameters

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 preceding this limit. Default values: Cisco 3350 (30000), Cisco 3310 (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 field can be used for asynchronous transport types which do not acknowledge the receipt of the notification and there is a possibility that the notification might be lost in transit. Default value is 1. **Note** The mobility services engine does not store events in its database.
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.
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 Tag Engine Status

To access the Tag Engine Status page, choose **Services** > **Mobility Services** > *MSE Name* > **Context Aware Service** > **Tag Engine** > **Status**.

Note This option appears only if Partner Tag engine was chosen as the engine.

If tag licenses are available, then Aeroscout Tag Engine is enabled. Otherwise, Cisco Tag Engine is enabled by default.

If only the evaluation license is available, then the Cisco Tag Engine is enabled by default. The Tag Engine status page shows status based on whether it is a Aeroscout Tag Engine or Cisco Tag Engine.

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

Table 16-10 describes the fields in the Tag Engine Status page for the Aeroscout Tag Engine.

Table 16-10 Tag Engine Status Fields

Field	Description
Tag Location Engine Name	The Partner engine name, which is **aeroscout**.
Version	Version of the Aeroscout Tag Engine.
Description	Description for the Tag Engine.
Registered	Appears as True when the Aeroscout Tag Engine has established communication with the mobility services engine.
Active	Appears as True when the Aeroscout Tag Engine is up and running.
License Information	The maximum tags that are available with the Aeroscout Tag Engine.

If you selected Cisco Tag Engine for Context Aware Service, the Tag Engine Status page displays the following information.

Table 16-11 describes the fields in the Tag Engine Status page for the Cisco Tag Engine.

Table 16-11 Tag Engine Status Fields

Field	Description
Tag Location Engine Name	The Tag location engine name, which is **Cisco**.
Version	Version of the Cisco Tag Engine.
Description	Description for the Cisco Tag Engine.
Active	Displays as True when the Cisco Tag Engine is up and running.
License Information	The maximum tags that are available with the Cisco Tag Engine.

Viewing Notification Information for Mobility Services

The **Services > Context Aware Notifications** page provides the ability to define events. This section contains the following topics:

- Viewing the Notifications Summary for Mobility Services, page 16-69
- Viewing and Managing Notifications Settings for Mobility Services, page 16-71
- Viewing Notification Statistics, page 16-71

Viewing the Notifications Summary for Mobility Services

To view the Notification Summary, choose **Services > Context Aware Notifications > Summary**.

The mobility service sends event notifications and does not store them (fire and forget). However, if NCS is a destination of notification events, it stores the notifications it receives and groups them into the following seven categories:

- Absence (Missing)—Generated when the mobility service cannot see the asset in the WLAN for the specified time.
- Location Change Events—Generated when client stations, asset tags, rogue clients, and rogue access points move from their previous location.
- Chokepoint Notifications—Generated when a tag is seen (stimulated) by a chokepoint. This information is only reported and displayed for CCX v.1-compliant tags.
- Battery Level—Generated when a tracked asset tag hits the designated battery level.
- In/Out Area—Generated when an asset is moved inside or outside a designated area.

Note You define a containment area (campus, building, or floor) in the Maps section of NCS (Monitor > Maps). You can define a coverage area using the Map Editor.

- Movement from Marker—Generated when an asset is moved beyond a specified distance from a designated marker you define on a map.
- Emergency—Generated for a CCX v.1 compliant asset tag when the panic button of the tag is triggered or the tag becomes detached, tampered with, goes inactive or reports an unknown state. This information is only reported and displayed for CCX v.1 compliant tags.

The summary details include the following:

- All Notifications
- Client Stations
- Asset Tags
- Rogue Clients
- Rogue Access Points

Note To view details for each of the notifications, click the number under the Last Hour, Last 24 Hours, or Total Active column to open the details page for the applicable notification.

Notifications Cleared

A mobility service sends event notifications when it clears an event condition in one of the following scenarios:

- Missing (Absence)—Elements reappear.
- In/Out Area (Containment)—Elements move back in or out of the containment area.
- Distance—Elements move back within the specified distance from a marker.
- Location Changes—Clear state is not applicable to this condition.
- Battery Level—Tags are detected again operating with Normal battery level.
- Emergency
- Chokepoint

Note In NCS, the Notifications Summary page reflects whether notifications for cleared event conditions have been received.

Viewing and Managing Notifications Settings for Mobility Services

Note An Event Group must be created which contains the rules that trigger a notification.

To view the Notifications Settings, follow these steps:

Step 1 Choose **Services > Context Aware Notifications**.

Step 2 From the left sidebar menu, choose **Settings**.

Viewing Notification Statistics

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

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

Table 16-12 lists and describes the fields in the Notification statistics page.

Table 16-12 Notification Statistics Fields

Field	Description
Summary	
Destinations	
Total	Total count of the destinations.
Unreachable	Count of unreachable destinations.
Notification Statistics Summary	
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.
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. For example, SOAP_XML.
Destination Status	Status of the destination device. The status is either Up or Down.

Table 16-12 Notification Statistics Fields

Field	Description
Summary	
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.

About Event Groups

To manage events more efficiently, you can use NCS to create event groups. Event groups help you organize your event definitions.

This section contains the following topics:

- Adding Event Groups, page 16-72
- Deleting Event Groups, page 16-72
- Working with Event Definitions, page 16-73
- Deleting an Event Definition, page 16-79

Adding Event Groups

To add an event group, follow these steps:

Step 1 Choose **Services > Context Aware Notifications**.

Step 2 Choose **Notification Definitions** from the left sidebar menu.

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

Step 4 Click **Go**.

Step 5 Enter the name of the group in the Group Name text box.

Step 6 Click **Save**.

The new event group appears in the Event Settings page.

Deleting Event Groups

To delete an event group, follow these steps:

Step 1 Choose **Services > Context Aware Notifications**.

Step 2 Choose **Notification Definitions** from the left sidebar menu.

Step 3 Select the check box of the event group you want to delete.

Step 4 From the Select a command drop-down list, choose **Delete Event Group(s)**.

Step 5 Click **Go**.

Step 6 Click **OK** to confirm the deletion.

Step 7 Click **Save**.

Working with Event Definitions

An event definition contains information about the condition that caused the event, the assets to which the event applies, and the event notification destinations. This section describes how to add, delete, and test event definitions.

Note NCS enables you to add definitions on a per-group basis. Any new event definition must belong to a particular group.

To add an event definition, follow these steps:

Step 1 Choose **Services > Context Aware Notifications**.

Step 2 From the left sidebar menu, choose **Notification Definitions**.

Step 3 Click the name of the group to which you want to add the event. An event definition summary page appears for the selected event group.

Step 4 From the Select a command drop-down list, choose **Add Event Definition**.

Step 5 Click **Go**.

Step 6 Enter the name of the event definition in the Event Definition Name text box.

Note The event definition name must be unique within the event group.

Step 7 Click **Save**.

Step 8 On the General tab, manage the following parameters:

- Admin Status—Enable event generation by selecting the **Enabled** check box (disabled by default).
- Priority—Set the event priority by choosing a number from the drop-down list. Zero is highest.

  Note An event definition with higher priority is serviced before event definitions with lower priority.

- Activate—To continuously report events, choose the **All the Time** checkbox. To indicate specific days and times for activation, unselect the **All the Time** checkbox and choose the applicable days and From/Until times. Click **Save**.

Step 9 On the Conditions tab, add one or more conditions. For each condition, specify the rules for triggering event notification. To add a condition, follow these steps:

a. Click **Add** to open the Add/Edit Condition page.

b. Choose a condition type from the Condition Type drop-down list and configure its associated Trigger If parameters see (Table 16-13).

Table 16-13 Condition Type/Trigger If Parameters

Condition Type	Trigger If
Missing	Missing for Time (mins)—Enter the number of minutes after which a missing asset event is generated. For example, if you enter 10 in this text box, the mobility services engine generates a missing asset event if the mobility services engine has not located the asset for more than 10 minutes.
In/Out	Inside of or Outside of—Click **Select Area** and choose the area parameters from the Select page. Click **Select**. The area to monitor can be an entire campus, building within a campus, a floor in a building, or a coverage area (you can define a coverage area using the map editor).
Distance	In the distance of *x* (feet) from Marker text box—Enter the distance in feet that triggers an event notification if the monitored asset moves beyond the specified distance from a designated marker. Click **Select Marker** and choose the marker parameters in the Select page. Click **Select**.
Battery Level	Battery Level Is—Low, Medium, Normal. Select the appropriate battery level that triggers an event.
Location Change	An event is triggered if the location of the asset changes.
Emergency	Select **Any**, **Panic Button**, **Tampered**, or **Detached** check box.
Chokepoint	In the range of Chokepoints—Click **Select Chokepoint** check box and choose the chokepoint parameters in the Select page. Click **Select**.

c. In the Apply To drop-down list, choose the type of asset (**Any**, **Clients**, **Tags**, **Rogue APs**, **Rogue Clients** or **Interferers**) for which an event is generated if the trigger condition is met.

Note Emergency and chokepoint events are only applicable to tags (CCXv.1 compliant).

d. From the Match By drop-down list, choose the matching criteria (**MAC Address**, **Asset Name**, **Asset Group**, or **Asset Category**), the operator (**Equals** or **Like**), and enter the relevant text for the selected Match By element.

e. Click **Add**.

Step 10 On the Destination and Transport tab, follow these steps to add one or more destinations to receive event notifications and configure the transport settings:

a. Click **Add** to open the Add/Edit Destination and Transport page.

b. To add one or more new destinations, click **Add New**, enter the applicable IP address, and click **OK**.

Note The recipient system must have an event listener running to process notifications. By default, when you create an event definition, NCS adds its IP address as the destination.

c. To select a destination to receive notifications, click to highlight one or more IP addresses in the box on the right and click **Select** to add the IP address(es) to the box on the left.

d. From the Message Format field drop-down list, select **XML** or **Plain Text**.

Note If you select NCS as the destination, you must select XML format.

e. Choose one of the following transport types from the Transport Type drop-down list:

- **SOAP**—Simple Object Access Protocol. Use SOAP to send notifications over HTTP/HTTPS and to be processed by web services on the destination.

  Specify whether to send notifications over HTTPS by selecting its corresponding check box. Enter the destination port number in the Port Number text box.

- **Mail**—Use this option to send notifications through e-mail.

  Choose the protocol for sending the e-mail from the Mail Type drop-down list. Enter the following: username and password (if Authentication is enabled), name of the sender, prefix to add to the subject line, e-mail address of recipient, and a port number if necessary.

- **SNMP**—Simple Network Management Protocol. Use this option to send notifications to SNMP-capable devices.

  If you have selected SNMP version v2c then you are prompted to enter the SNMP community string in the SNMP Community text box and the applicable port number in the Port Number text box.

  If you have selected SNMP version v3 then you are prompted to enter the username, security name, choose the authentication type from the drop-down list, enter the authentication password, choose the privacy type from the drop-down list and enter the privacy password.

- **SysLog**—Specifies the system log on the destination system as the recipient of event notifications.

- Enter the notification priority in the Priority text box, the name of the facility, and the port number on the destination system.

f. Click **Add**.

Step 11 Verify that the new event definition is listed for the event group (Context Aware Service > Notifications > Event > Settings > Event Group Name).

Adding Event Definitions

An event definition contains information about the condition that caused the event, the assets to which the event applies, and the event notification destination.

The NCS enables you to add definitions for each group. An event definition must belong to a group. See the *Cisco Content-Aware Software Configuration Guide* for more information on deleting or testing event definitions.

To add an event definition, follow these steps:

Step 1 Choose **Services > Context Aware Notifications**.

Step 2 Choose **Notification Definitions** from the left sidebar menu.

Step 3 Click the name of the group to which you want to add to the event. An event definition summary page appears for the selected event group.

Step 4 From the Select a command drop-down list, choose **Add Event Definition**, and click **Go**.

Step 5 On the Conditions tab, add one or more conditions. For each condition you add, specify the rules for triggering event notifications.

Tip For example, to keep track of heart monitors in a hospital, you can add rules to generate event notifications when a heart monitor is missing for one hour, a heart monitor moves off its assigned floor, or a heart monitor enters a specific coverage area within a floor.

To add a condition, follow these steps:

a. Click **Add** to add a condition that triggers this event.

b. In the Add/Edit Condition dialog box, follow these steps:

1. Choose a condition type from the Condition Type drop-down list.

   If you chose Missing from the Condition Type drop-down list, enter the number of minutes after which a missing asset event is generated. For example, if you enter 10 in this text box, the mobility service engine generates a missing asset event if the mobility service engine has not found the asset for more than 10 minutes. Proceed to Step c.

   If you chose In/Out from the Condition Type drop-down list, choose **Inside of** or **Outside of**, then select **Select Area** to select the area to monitor for assets going into it or out of it. In the Select dialog box, choose the area to monitor, then click **Select**. The area to monitor can be an entire campus, building within a campus, a floor in a building, or a coverage area (you can define a coverage area using the map editor). For example, to monitor part of a floor in a building, choose a campus from the Campus drop-down list, choose a building from the Building drop-down list, and choose the area to monitor from the Floor Area drop-down list. Then click **Select**. Proceed to Step c.

   If you chose Distance from the Condition Type drop-down list, enter the distance in feet that triggers an event notification if the monitored asset moves beyond the specified distance from a designated marker, then click **Select Marker**. In the Select dialog box, choose the campus, building, floor, and marker from the corresponding drop-down list, and click **Select**. For example, if you add a marker to a floor plan and set the distance in the Trigger. If the text box is set to 60 feet, an event notification is generated if the monitored asset moves more than 60 feet away from the marker. Proceed to Step c.

   Note You can create markers and coverage areas using the Map Editor. When you create marker names, make sure they are unique across the entire system.

   If you chose Battery Level from the Condition Type drop-down list, select the check box next to the battery level (low, medium, normal) that triggers an event. Proceed to Step c.

If you chose Location Change from the Condition Type drop-down list, proceed to Step c.

If you chose Emergency from the Condition Type drop-down list, click the button next to the emergency (any, panic button, tampered, detached) that triggers an event. Proceed to Step c.

If you chose Chokepoint from the Condition Type drop-down list, proceed to Step c. There is only one trigger condition, and it is displayed by default. No configuration is required.

c. From the Apply To drop-down list, choose the type of asset (Any, Clients, Tags, Rogue APs, Rogue Clients, or Interferers) for which an event is generated if the trigger condition is met.

Note If you choose the any option from the Apply to drop-down list, the battery condition is applied to all tags, clients, and rogue access points and rogue clients.

Note Emergency and chokepoint events apply only to Cisco-compatible extension tags Version 1 (or later).

d. From the Match By drop-down list, choose the matching criteria (**MAC Address**, **Asset Name**, **Asset Group**, or **Asset Category**), the operator (**Equals** or **Like**) from the drop-down list, and enter the relevant text for the selected Match By element.

Some examples of asset matching criteria that you can specify:

- If you choose **MAC Address** from the Match By drop-down list, choose **Equals** from the Operator drop-down list, and enter a MAC address (for example, 12:12:12:12:12:12), the event condition applies to the element whose MAC address is 12:12:12:12:12:12 (exact match).
- If you choose **MAC Address** from the Match By drop-down, choose **Like** from the Operator drop-down list, and enter **12:12**, the event condition applies to elements whose MAC address starts with 12:12.

e. Click **Add** to add the condition you have just defined.

Note If you are defining a chokepoint, you must select the chokepoint after you add the condition.

To select a chokepoint, do the following:

1. Click **Select Chokepoint**. An entry page appears.
2. Choose **Campus**, **Building**, and **Floor** from the appropriate drop-down lists.
3. Choose a Chokepoint from the menu that appears.

You are returned to the Add/Edit Condition page, and the location path (Campus > Building > Floor) for the chokepoint auto-populates the text area next to the Select Checkpoint button.

Step 6 On the Destination and Transport tab, follow these steps to add one or more destinations to receive event notifications and to configure the transport settings:

a. To add a new destination, click **Add**. The Add/Edit Destination configuration page appears.

b. Click **Add New**.

c. Enter the IP address of the system that receives event notifications, and click **OK**.

The recipient system must have an event listener running to process notifications. By default, when you create an event definition, NCS adds its IP address as the destination.

d. To select a destination to send event notifications to, highlight one or more IP addresses in the box on the right, and click **Select** to add the IP addresses to the box on the left.

e. Choose **XML** or **Plain Text** to specify the message format.

f. Choose one of the following transport types from the Transport Type drop-down list:

- **SOAP**—Specifies Simple Object Access Protocol, a simple XML protocol, as the transport type for sending event notifications. Use SOAP to send notifications over HTTP/HTTPS that are processed by web services on the destination.

  If you choose SOAP, specify whether to send notifications over HTTPS by selecting its corresponding check box. If you do not, HTTP is used. Also, enter the destination port number in the Port Number text box.

- **Mail**—Use this option to send notifications through e-mail.

  If you choose Mail, you need to choose the protocol for sending the e-mail from the Mail Type drop-down list. You also need to enter the following information: username and password (if Authentication is enabled), name of the sender, prefix to add to the subject line, e-mail address of recipient, and a port number if necessary.

- **SNMP**—Use Simple Network Management Protocol, a very common technology for network monitoring used to send notifications to SNMP-capable devices.

  If you choose SNMP, enter the SNMP community string in the SNMP Community text box and the port number to send notifications to in the Port Number text box.

- SysLog—Specifies the system log on the destination system as the recipient of event notifications.

  If you choose SysLog, enter the notification priority in the Priority text box, the name of the facility in the Facility text box, and the port number of the destination system in the Port Number text box.

g. To enable HTTPS, select the **Enable** check box next to it.

Port Number auto-populates.

h. Click **Save**.

Step 7 On the General tab, follow these steps:

a. Select the **Enabled** check box for Admin Status to enable event generation (disabled by default).

b. Set the event priority by choosing a number from the Priority drop-down list. Zero is the highest priority.

Note An event notification with high priority is serviced before event definitions with lower priority.

c. To select how often the event notifications are sent:

1. Select the **All the Time** check box to continuously report events. Proceed to Step g.
2. Unselect the **All the Time** check box to select the day and time of the week that you want event notifications sent. Days of the week and time fields appear for the selection. Proceed to Step d.

d. Select the check box next to each day you want the event notifications sent.

e. Select the time for starting the event notification by selecting the appropriate hour, minute, and AM/PM options from the Apply From heading.

f. Select the time for ending the event notification by selecting the appropriate hour, minute, and AM/PM options from the Apply Until heading.

g. Click **Save**.

Step 8 Verify that the new event notification is listed for the event group (Mobility > Notifications > Settings > Event Group Name).

Deleting an Event Definition

To delete one or more event definitions from NCS, follow these steps:

Step 1 Choose **Services > Context Aware Notifications**.

Step 2 From the left sidebar menu, choose **Settings**.

Step 3 Click the name of the group from which you want to delete the event definitions.

Step 4 Select the event definition that you want to delete by selecting its corresponding check box.

Step 5 From the Select a command drop-down list, choose **Delete Event Definition(s)**.

Step 6 Click **Go**.

Step 7 Click **OK** to confirm that you want to delete the selected event definitions.

Client Support on MSE

You can use the NCS advanced search feature to narrow the client list based on specific categories and filters. See the "Using the Search Feature" section on page 2-33 section or the "Advanced Search" section on page 2-34 for more information.You can also filter the current list using the Show drop-down list. See the " Filtering Clients and Users" section on page 10-11 for more information.

This section contains the following topics:

Searching a Wireless Client from NCS on MSE by IPv6 Address

Note Only wireless clients have IPv6 addresses in this release.

To search for a MSE located clients using the NCS Advanced search feature, follow these steps:

Step 1 Click **Advanced Search** located in the top right corner of the NCS UI

Step 2 In the New Search dialog, choose **Clients** as the search category from the Search Category drop-down list.

Step 3 From the Media Type drop-down list, choose **Wireless Clients**.

Note The Wireless Type drop-down list appears only when you choose Wireless Clients as the media type.

Step 4 From the Wireless Type drop-down list, choose any of the following types: **All**, **Lightweight or Autonomous Clients**.

Step 5 From the Search By drop-down list, choose **IP Address**.

Note Searching a client by IP address can contain either full or partial IP address. Each client can have up to 16 IPv6 addresses and 4 IPv4 addresses.

Step 6 From the Clients Detected By drop-down list, choose clients detected by as MSE.

This displays clients located by Context-Aware Service in the MSE by directly communicating with the controllers.

Step 7 From the Last detected within drop-down list, choose the time within which the client was detected.

Step 8 Enter the client IP address in the Client IP Address text box. You can enter wither a partial or full IPv6 address.

Note If you are searching for the client from NCS on the MSE by IPv4 address, enter the IPv4 address in the Client IP address text box.

Step 9 From the Client States drop-down list, choose the client states. The possible values for wireless clients are **All States**, **Idle**, **Authenticated**, **Associated**, **Probing**, or **Excused**. The possible values for wired clients are **All States**, **Authenticated**, and **Associated**.

Step 10 From the Posture Status drop-down list, choose the posture status to know if the devices are clean or not. The possible values are **All**, **unknown**, **Passed**, **and Failed**.

Step 11 Select the **CCX Compatible** check box to search for clients that are compatible with Cisco Client Extensions. The possible values are **All Versions**, **V1**, **V2**, **V3**, **V4**, **V5**, and **V6**.

Step 12 Select the **E2E Compatible** check box to search for clients that are end to end compatible. The possible values are **All Versions**, **V1**, and **V2**.

Step 13 Select the **NAC State** check box to search for clients identified by a certain Network Admission Control (NAC) state. The possible values are **Quarantine**, **Access**, **Invalid**, and **Not Applicable**.

Step 14 Select the **Include Disassociated** check box to include clients that are no longer on the network but for which NCS has historical records.

Step 15 From the **Items per page** drop-down list, choose the number of records to be displayed in the search results page.

Step 16 Select the **Save Search** check box to save the selected search option.

Step 17 Click Go.

The Clients and Users page appears with all the clients detected by the MSE.

Viewing the Clients Detected by MSE

To view all the clients detected by MSE, follow these steps:

Step 1 Choose **Monitor > Clients and Users** to view both wired and wireless clients information.

The Client and Users page appears.

The Clients and Users table displays a few column by default. If you want to display the additional columns that are available, click , and then click **Columns**. The available columns appear. Select the columns that you want to show in the Clients and Users table. When you click anywhere in a row, the row is selected and the client details are shown.

Step 2 Filter the current list to choose all the clients that are detected by MSE by choosing **Clients detected by MSE** from the Show drop-down list.

All the clients detected by MSE including wired and wireless appear.

The following different parameters are available in the Clients Detected by MSE table:

- MAC Address—Client MAC address.
- IP Address—Client IP address.

  The IP Address that appears in the IP Address column is determined by a predefined priority order. The first IP address available in the following order appears in the IP address text box:

  – IPv4 address

  Note Only wireless clients have IPv6 addresses in this release. Each client can have up to 16 IPv6 addresses and 4 IPv4 addresses.

  – IPv6 global unique address. If there are multiple addresses of this type, most recent IPv6 address that the client received is shown, because a user could have two Global IPv6 addresses but one might have been from an older Router Advertisement that is being aged out.
  – IPv6 local unique address. If there are multiple IPv6 local unique addresses, then the most recent address appears.
  – IPv6 link local address. For an IPv6 client it always have at least a link local address.

  The following are the different IPv6 address types:

  – Link-local Unicast—The link-local addresses are designed to be used for addressing on a single link for purposes such as auto-address configuration, neighbor discovery, or when no routers are present.
  – Site-local Unicast—The site-local addresses are designed to be used for addressing inside of a site without the need for a global prefix.
  – Aggregatable Global Unicast—The aggregatable global unicast address uniquely identifies the client in global network and equivalent to public IPv4 address. A client can have multiple aggregatable global unicast addresses.
- IP Type—The IP address type can be IPv4 and IPv6.
  – Global Unique
  – Unique Local
  – Link Local
- User Name—Username based on 802.1x authentication. Unknown is displayed for client connected without a username.
- Type—Indicates the client type.
  – indicates a lightweight client

  -  indicates a wired client
  -  indicates an autonomous client
- Vendor—Device vendor derived from OUI.
- Device Name—Network authentication device name. For example, WLC and switch.
- Location—Map location of the connected device.
- VLAN—Indicates the access VLAN ID for this client.
- Status—Current client status.
  - Idle—Normal operation; no rejection of client association requests.
  - Auth Pending—Completing a AAA transaction.
  - Authenticated—802.11 authenticated complete.
  - Associated—802.11 association complete. This is also used by wired clients to represent that a client is currently connected to the network.
  - Disassociated—802.11 disassociation complete. This is also used by wired clients to represent that a client is currently not on the network.
  - To Be Deleted—The client is deleted after disassociation.
  - Excluded—Automatically disabled by the system due to perceived security threat.
- Interface—Controller interface (wireless) or switch interface (wired) that the client is connected to.
- Protocol
  - 802.11—wireless
  - 802.3—wired
- Association Time—Last association start time (for wireless client). For a wired client, this is the time when a client is connected to a switch port. This is blank for a client which is associated but has problems being on the network.
- CCX—Lightweight wireless only.

Step 3 Select the radio button next to MAC Address in the Client and User page to view the associated client information. The following are the different client parameters that appear.

- Client Attributes
- Client IPv6 Addresses
- Client Statistics

Note Client Statistics shows the statistics information after the client details are shown.

- Client Association History
- Client Event Information
- Client Location Information
- Wired Location History
- Client CCX Information

Client Attributes

When you select a client from the Clients and Users list, the following client details are displayed. Clients are identified using the MAC address.

These following details are displayed:

- General—Lists the following information:
  - User Name
  - IP Address
  - MAC address
  - Vendor
  - Endpoint Type
  - Client Type
  - Media Type
  - Mobility Role
  - Hostname
  - E2E
  - Power Save
  - CCX
  - Foundation Service
  - Management Service
  - Voice Service
  - Location Service

Note Click the icon next to the username to access the correlated users of a user.

- Session—Lists the following client session information:
  - Controller Name
  - AP Name
  - AP IP Address
  - AP Type
  - AP Base Radio MAC
  - Anchor Address
  - 802.11 State
  - Association ID
  - Port
  - Interface
  - SSID
  - Profile Name
  - Protocol

  - VLAN ID
  - AP Mode
- Security (wireless and Identity wired clients only)—Lists the following security information:
  - Security Policy Type
  - EAP Type
  - On Network
  - 802.11 Authentication
  - Encryption Cipher
  - SNMP NAC State
  - RADIUS NAC State
  - AAA Override ACL Name
  - AAA Override ACL Applied Status
  - Redirect URL
  - ACL Name
  - ACL Applied Status
  - FlexConnect Local Authentication
  - Policy Manager State
  - Authentication ISE
  - Authorization Profile Name
  - Posture Status
  - TrustSec Security Group
  - Windows AD Domain

Note The identity clients are the clients whose authentication type is 802.1x, MAC Auth Bypass or Web Auth. For non-identity clients, the authentication type is N/A.

Note The data that appears under the client attributes differs based on identity and non-identity clients. For identity clients, you can see the security information such as Authentication status, Audit Session ID, and so on.

- Statistics (wireless only)
- Traffic—Shows the client traffic information.
- For wireless clients, client traffic information comes from controller. For wired clients, the client traffic information comes from ISE, and you must enable accounting information and other necessary functions on switches.

Statistics

The Statistics group box contains the following information for the selected client:

- Client AP Association History

- Client RSSI History (dBm)—History of RSSI (Received Signal Strength Indicator) as detected by the access point with which the client is associated.
- Client SNR History—History of SNR (signal-to-noise Ratio of the client RF session) as detected by the access point with which the client is associated.
- Bytes Sent and Received (Kbps)—Bytes sent and received with the associated access point.
- Packets Sent and Received (per sec)—Packets sent and received with the associated access point.
- Client Data rate

Note Hover your mouse cursor over points on the graph for additional statistical information.

This information is presented in interactive graphs. See the "Interactive Graphs" section on page 9-248 for more information.

Client IPv6 Addresses

The IPv6 address group box contains the following information for the selected client:

- IP Address—Shows the clients IPv6 address.
- Scope—Contains 3 types scope. They are Global Unique, Local Unique, and Link Local.
- Address Type—Shows the address type.
- Discovery Time—Time when the IP was discovered.

Association History

The association history dashlet shows information regarding the last ten association times for the selected client. This information helps in troubleshooting the client.

The Association History dashlet contains the following information:

- Association Time
- Duration
- User Name
- IP Address
- IP Address Type
- AP Name
- Controller Name
- SSID

Events

The Event group box of the Client Details page display all events for this client including the event type as well as the date and time of the event.

- Event Type
- Event Time
- Description

Map

Click **View Location History** to view location history details of wired and wireless clients.

You can view the location details for wired and wireless clients.

The following location history information is displayed for a wired or wireless client:

- Timestamp
- State
- Port Type
- Slot
- Module
- Port
- User Name
- IP Address
- Switch IP
- Server Name
- Map Location Civic Location

Upgrading from 5.0 to 6.0 or 7.0

Caution The number of supported clients, tags, and access points (wIPS) is reset to 100 clients, 100 tags, and 20 access points when you upgrade to Release 6.0 or later. All tracking beyond these limits is lost. These limits correspond to the 60-day evaluation licenses that are standard.

Caution When upgrading the mobility services engine from 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 7.0.

Caution You must back up the mobility services engine database before upgrading from release 5.1 or 6.0 to 7.0 to preserve client, tag, and access point configurations. You can restore the database after the software upgrade.

Note Release 5.1 did not support licenses. You must order, register, and install licenses to track client and tag locations (CA) or access points (wIPS) beyond the limits of the 60-day evaluation licenses.

To upgrade to release 7.0, follow these steps:

Step 1 Register the Product Authorization Key (PAK).

Note You receive a PAK when you order a license. If you have lost your PAK, you can use your sales order or the UDI number of the mobility services engine to register.

- Client and wIPS licenses are registered at: www.cisco.com/go/license
- Tag licenses are registered at: http://www.aeroscout.com/support

Step 2 Back up the mobility services engine database:

a. Choose **Services > Mobility Services**.

b. Click the name of the mobility services engine on which you want to back up.

c. Choose **System > Maintenance.**

d. Click **Backup**.

e. Enter the name of the backup file.

f. Click **Submit** to backup the historical data to the hard drive of the server running the NCS.

Step 3 Download release 7.0:

a. Choose **Services > Mobility Services**.

b. Click the name of the mobility services engine to which you want to download the software.

c. Choose **System > Maintenance > Download Software** from the left sidebar menu.

d. To download software, do one of the following:

- To download software listed in the NCS directory, select the **Select from uploaded images to transfer** into the Server radio button. Choose a binary image from the drop-down list.

  NCS downloads the binary image to the FTP server directory you specified during the NCS installation.

- To use downloaded software available locally or over the network, select the **Browse a new software image to transfer into the Server** radio button and click **Choose File**. Locate the file and click **Open**.

e. Click **Download** to send the software to the /opt/installers directory on the mobility services engine.

Step 4 Install release 7.0 using the MSE CLI:

a. To overwrite existing software, enter:

```
/etc/init.d/msed stop
cd opt/installers
./<mse software file name>
```

b. To perform a fresh install, enter:

```
/etc/init.d/msed stop
cd /opt/mes/uninstall
```

./uninstall *(*enter this once in directory)

(Enter no when prompted to keep old database)

```
cd /opt/installers
./<mse software file name>
```

Step 5 Restore the mobility services engine database (For Step 4 b.):

a. Choose **Services > Mobility Services**.

b. Click the name of the mobility services engine on which you upgraded the software.

c. Choose **Maintenance > Restore** from left sidebar menu.

d. Choose the filename to restore from the drop-down list. Click **Submit**.

Step 6 Install the licenses.

See the Chapter 2 of the *ContextAware Services Configuration Guide Release 7.0* at

http://www.cisco.com/en/US/products/ps9806/products_installation_and_configuration_guides_list.html for more information.

Viewing the MSE Alarm Details

In the Monitor > Alarms page, click an MSE item under Failure Source column to access the alarms details for a particular MSE.

Alternatively, you can choose **Services > Mobility Services >** *MSE Name* **> System > Status > NCS Alarms** page and click a particular MSE item under Failure Source column to access the alarms details for a particular MSE.

Figure 16-2 shows a NCS alarm for MSE.

Figure 16-2 MSE Alarm

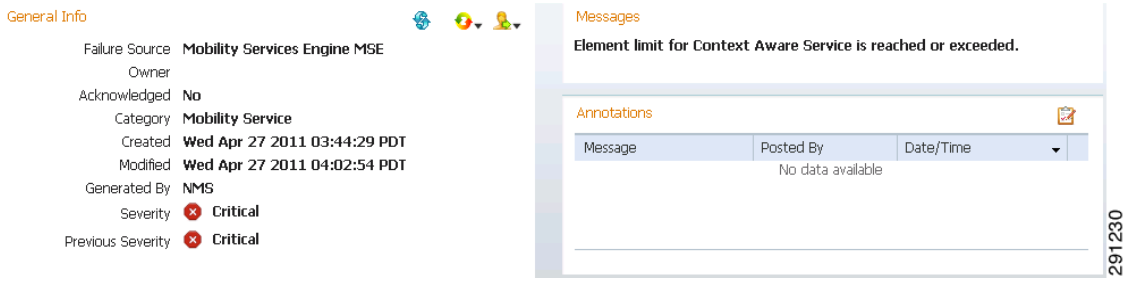


Table 16-14 describes the various fields in the Alarm Detail page for an MSE.

Table 16-14 General Parameters

Field	Description
Failure Source	The MSE that generated the alarm.
Owner	Name of person to which this alarm is assigned, or blank.
Acknowledged	Displays whether or not the alarm is acknowledged by the user.
Category	The category of the alarm.The Alarm category is Mobility Services for MSEs.
Created	Month, day, year, hour, minute, second, AM or PM alarm created.
Modified	Month, day, year, hour, minute, second, AM or PM alarm last modified.
Generated By	This field displays MSE.

Table 16-14 General Parameters (continued)

Field	Description
Severity	Level of security: Critical, Major, Minor, Warning, Clear, Info, Color coded.
Previous Severity	Critical, Major, Minor, Warning, Clear, Info. Color coded.

Note The General information might vary depending on the type of alarm. For example, some alarm details might include location and switch port tracing information.

- Annotations—Enter any new notes in this text box and click **Add** to update the alarm. Notes appear in the "Annotations" display page.
- Messages—Displays information about the alarm.
- Audit Report—Click to view config audit alarm details. This report is only available for Config Audit alarms.

  Configuration audit alarms are generated when audit discrepancies are enforced on config groups.

  Note If enforcement fails, a critical alarm is generated on the config group. If enforcement succeeds, a minor alarm is generated on the config group.

  The alarms have links to the audit report where you can view a list of discrepancies for each controller.

- Event History—Opens the MSE Alarm Events page to view events for this alarm. When there are multiple alarm pages, the page numbers appear at the top of the page with a scroll arrow on each side. Use these scroll arrows to view additional alarms.

Select a command

The Select a command drop-down list provides access to the following functions:

- Assign to me—Assign the selected alarm(s) to the current user.
- Unassign—Unassign the selected alarm(s).
- Delete—Delete the selected alarm(s).
- Clear—Clear the selected alarm(s). Indicates that the alarm is no longer detected by any access point.

  Note Once the severity is Clear, the alarm is deleted from NCS after 30 days.

- Acknowledge—You can acknowledge the alarm to prevent it from showing up in the Alarm Summary page. The alarm remains in NCS and you can search for all Acknowledged alarms using the alarm search functionality. See the "Acknowledging Alarms" section on page 5-144 for more information.
- Unacknowledge—You can choose to unacknowledge an already acknowledged alarm.

- Email Notification—Takes you to the All Alarms > Email Notification page to view and configure e-mail notifications. See the "Monitoring RFID Tags" section on page 5-119 for more information.
- Event History—Takes you to the Monitor > Events page to view events for this alarm. See the "Monitoring Events" section on page 5-152 for more information.

See the "Monitoring Alarms" section on page 5-134 for more information on Alarms.

MSE License Overview

The MSE packages together multiple product features related to network topology, design such as NMSP, Network Repository along with related Service Engines, and application processes, such as the following:

- Context-Aware Service
- Wireless Intrusion Prevention System (WIPS)

To enable smooth management of MSE and its services, various licenses are offered.

Note You must have a Cisco NCS license to use MSE and its associated services.

This section contains the following topics:

MSE License Structure Matrix

Table 16-15 lists the breakdown of the licenses between the High end, Low end and Evaluation licenses for MSE, Location services, SCM, wIPS and MIR.

Table 16-15 MSE License Structure Matrix

	High End	Low End	Evaluation
MSE Platform	High-end appliance and infrastructure platform such as the Cisco 3350 and 3355 mobility services engines.	Low-end appliance and Infra-structure platform such as Cisco 3310 mobility services engine.	—
Context Aware Service	18,000 Tags	2000 Tags	Validity 60 days, 100 Tags and 100 Elements.
	18,000 Elements	2000 Elements	
wIPS	3000 access points	2000 access points	Validity 60 days, 20 access points.

Sample MSE License File

The following is a sample MSE license file:

```
FEATURE MSE cisco 1.0 permanent uncounted \
```

```
VENDOR_STRING=UDI=udi,COUNT=1 \
HOST ID=ANY \
NOTICE="<LicFileID>MSELicense</LicFileID><LicLineID>0</LicLineID> \
<PAK>dummyPak</PAK>" \
SIGN="0C04 1EBA BE34 F208 404F 98ED 43EC \
45D7 F881 08F6 7FA5 4DED 43BC AF5C C359 0444 36B2 45CF 6EA6 \
1DB1 899F 413F F543 F426 B055 4C7A D95D 2139 191F 04DE"
```

This sample file has 5 license entries. The first word of the first line of any license entry tells you what type of license it is. It can either be a Feature or Increment license. A feature license is a static lone item to license. There can be multiple services engines running in MSE. An Increment license is an additive license. In MSE, the individual service engines are treated as increment licenses.

The second word of the first line defines the specific component to be licensed. For example, MSE, LOCATION_TAG. The third word depicts the vendor of the license, for example Cisco. The fourth word denotes the version of the license, example 1.0. The fifth word denotes the expiration date, this can be permanent for licenses that never expire or a date in the format dd-mm-yyyy. The last word defines whether this license is counted.

See the "Mobility Services Engine (MSE) License Information" section on page 15-136 for more information on the license types.

Revoking and Reusing an MSE License

You can revoke an MSE appliance license from one system and reuse it on another system. When you revoke a license, the license file is deleted from the system. If you want to reuse the license on another system, then the license needs to be rehosted.

If you want to reuse a license with an upgrade SKU on another system, then you must have the corresponding base license SKU installed in the system to which you want to reuse the upgrade SKU. You cannot reuse the upgrade license SKU in a system if the corresponding base license SKU is deleted from it.

When you revoke a license, MSE restarts the individual service engines to reflect the changes to the licenses. Then the service engines receives the updated capacity from MSE during startup.

See the following sections for more information on Licensing:

- NCS License Information, page 15-132
- Mobility Services Engine (MSE) License Information, page 15-136
- Mobility Services Engine (MSE) License Summary, page 15-137

Deploying the MSE Virtual Appliance

MSE is also offered as a virtual appliance. The MSE virtual appliance software is distributed as an Open Virtualization Archive (OVA) file.

Note See the VMware cSphere 4.0 documentation for more information about setting up your VMware environment.

Note See the *Cisco Prime Network Control System. Getting Started Guide, Release 1.0* for more information on the physical appliance.

When the MSE is located on the physical appliance, the license installation process is based on Cisco UDI (Unique Device Identifier). Choose **Administration > License Center** on the NCS UI to add the license. When the MSE is located on the virtual appliance, the license installation is done using a VUDI (Virtual Unique Device Identifier) instead of UDI.

Note MSE is available as a virtual appliance for this release and later. Virtual appliance must be activated first before installing any other service licenses.

For a virtual appliance, you must have an activation license. Without an activation license, if MSE starts in evaluation mode even if the licenses are present on the host, it rejects the permanent license if the activation license is not installed. If the virtual appliance is added to NCS, NCS does not allow MSE to be synchronized unless the activation license is added to the MSE.

Note Virtual licenses are not allowed on physical appliances.

You can add and delete a virtual appliance license either using the **Services > Mobility Services Engine > Add Mobility Services Engine** page when you are installing MSE for the first time or you can use **Administration > License Center** page to add or delete a license.

See the "Adding a License File to MSE Using the License Center" section on page 16-92 and the "Deleting an MSE License File" section on page 16-8 for more information on adding a license and deleting a license using the Mobility Services Engine wizard.

This section contains the following topics:

Adding a License File to MSE Using the License Center

To add a license, follow these steps:

Step 1 Install the MSE virtual appliance.

Step 2 Add MSE to NCS using the "Adding a Mobility Services Engine" section on page 16-6.

Step 3 Choose **Administration > License Center** on the NCS UI to access the License Center page.

Step 4 Choose **Files > MSE Files** from the left sidebar menu.

Step 5 Click **Add** to add a license.

The Add A License File menu appears.

Step 6 Select the MSE and browse to the activation license file.

Step 7 Click Submit.

Once you submit, the license is activated and license information appears in the License Center page.

Viewing the MSE License Information using License Center

The license center allows you to manage NCS, Wireless LAN Controllers, and MSE licenses. To view the license information, follow these steps

Step 1 Choose **Administration > License Center** to access the License Center page.

Step 2 Choose **Summary > MSE** from the left sidebar menu, to view the summary page.

The MSE Summary page displays the following information. See Table 16-16.

Table 16-16 General Parameters

Field	Description
MSE Name	Provides a link to the MSE license file list page.
Service	Type of service using: CAS or wIPS.
Platform Limit	Platform limit.
Type	Specifies the type of MSE.
Installed Limit	Displays the total number of client elements licensed across MSEs.
License Type	The three different types of licenses. They are permanent, evaluation, and extension.
Count	The number of CAS or wIPS elements currently licensed across MSEs.
Unlicensed Count	Displays the number of client elements that are not licensed.
%Used	The percentage of CAS or wIPS elements licensed across MSEs.

Removing a License File Using the License Center

To remove a license, follow these steps:

Step 1 Install the MSE virtual appliance.

Step 2 Add MSE to NCS using the wizard.

Step 3 Choose **Administration > License Center** on NCS UI to access the License Center page.

Step 4 Choose **Files > MSE Files** from the left sidebar menu.

Step 5 Choose an MSE license file that you want to remove by selecting the radio button, and click **Remove**.

Step 6 Click **OK** to confirm the deletion.

Location Assisted Client Troubleshooting from the Context Aware Dashboard

You can use the Context Aware dashboard on the NCS home page to troubleshoot a client.

You can specify a MAC address or Username or IP address as the search criteria, and click **Troubleshoot**.

Note Username, IP address, and partial MAC address-based troubleshooting is supported only on MSEs Version 7.0.200.0 and later.

The Troubleshoot Client page appears.

You can view the Context Aware History report on the Context Aware History tab.

You can filter this report based on MSE Name. You can further filter the report based on Timezone, State or All. The states can be either associated or dissociated.

If you select timezone then you can select any of the following:

- Date and Time

Or

- Any one of these values from the drop-down list:
  - Last 1 Hour
  - Last 6 Hours
  - Last 1 Day
  - Last 2 Days
  - Last 3 Days
  - Last 4 Days
  - Last 5 Days
  - Last 6 Days
  - Last 7 Days
  - Last 2 Weeks
  - Last 4 Weeks

Alternately, you can use the Generate Report link to generate a Client Location History report. You can also opt to export to CSV or PDF format or e-mail the report using the icons available in the report page.

See the "Context Aware Dashboard" section on page 2-21 for more information on the Context Aware dashboard of the NCS home page.

MSE

You can generate many Context Aware reports using the Report Launch Pad. See the "ContextAware Reports" section on page 14-78 for more information on Context Aware reports.

Monitoring Maps

Maps provide a summary view of all your managed system on campuses, buildings, outdoor areas, and floors. See the "Monitoring Maps" section on page 6-8 for more information on maps.

Planning for and Configuring Context-Aware Software

Context-Aware Software (CAS) resides on the mobility services engine. For more information on the CAS service, see the *Cisco Context-Aware Software Configuration Guide.*

Note If you have a location server, you can track or map non-Cisco CCX tags.

Note Context-Aware Software was previously referred to as *Cisco location-based services*.

Chapter 4 of the *Cisco Context-Aware Software Configuration Guide* contains the following information on configuring and viewing system properties on the mobility services engine:

- Configuring general properties
- Modifying NMSP parameters
- Viewing active sessions on a system
- Adding and deleting trap destinations
- Viewing and configuring advanced parameters

Chapter 5 of the *Cisco Context-Aware Software Configuration Guide* contains information on configuring and managing users and groups on the mobility services engine.

Chapter 6 of the *Cisco Context-Aware Software Configuration Guide* contains the following information on event notifications:

- Adding and deleting event groups
- Adding, deleting, and testing event definitions
- Viewing event notification summary
- Notifications cleared
- Notification message formats

Chapter 7 of the *Cisco Context-Aware Software Configuration Guide* contains the following information on the tools and configurations that can be used to enhance the location accuracy of elements (clients, tags, rogue clients, interferers and rogue access points):

- Planning for data, voice, and location deployment
- Creating and applying calibration models
- Inspecting location readiness and quality
- Inspecting location quality using calibration data
- Verifying location accuracy
- Using chokepoints to enhance tag location reporting
- Using Wi-Fi TDOA receiver to enhance tag location reporting
- Using tracking optimized monitor mode to enhance tag location reporting
- Defining inclusion and exclusion regions on a floor
- Defining a rail line on a floor
- Modifying context aware software parameters
- Enabling Location Services on Wired Switches and Wired Clients.
- Assigning a Catalyst Switch to Mobility Services Engine and Synchronizing

Chapter 8 of the *Cisco Context-Aware Software Configuration Guide* contains the following information on how to monitor the mobility services engine by configuring and viewing alarms, events, and logs and how to generate reports on system utilization and element counts:

- Working with alarms
- Working with events
- Working with logs
- Generating reports
- Monitoring wireless clients
- Monitoring tagged assets
- Monitoring chokepoints
- Monitoring Wi-Fi TDOA receivers
- Monitoring Wired Switches
- Monitoring Wired Clients
- Monitoring Interferers

Chapter 9 of the *Cisco Context-Aware Software Configuration Guide* contains the following information on backing up and restoring mobility services engine data and updating the mobility services engine software:

- Recovering a lost password
- Recovering a lost root password
- Backing up and restoring mobility services engine data
- Downloading software to mobility services engines
- Configuring the NTP server
- Defragmenting the mobility services engine database

- Rebooting the mobility services engine hardware
- Shutting down the mobility services engine hardware
- Clearing mobility services engine configurations

wIPS Planning and Configuring

With a fully integrated solution, Cisco can continually monitor wireless traffic on both the wired and wireless networks and can use that network intelligence to analyze attacks from many different sources of information to more accurately pinpoint and proactively prevent attacks versus waiting until damage or exposure has occurred. See the *Cisco Adaptive Wireless IPS* documentation for the following information:

- NCS and wIPS integration overview
- Mobility services engines
- wIPS profiles
- Configuring SSID group list
- Viewing wIPS alarms
- Viewing wIPS events
- Configuring access points and access point templates
- policy alarm encyclopedia
- NCS security vulnerability assessment
- Rogue management
- Radio resource management

MSAP

Cisco Mobility Services Advertisement Protocol (MSAP) provides requirements for MSAP client and server and describes the message exchanges between them. Mobile devices can retrieve service advertisements from MSAP server over Wi-Fi infrastructure using MSAP. MSAP is introduced in this release of the Mobility Services Engine (MSE) and provides server functionality.

MSAP is used by the mobile devices that have been configured with a set of policies for establishing network connectivity. MSAP facilitates mobile devices to discover network based services available in a local network or services that are enabled through service providers. MSAP provides service advertisements, that describe available services to the mobile devices. Once the mobile device receives the service advertisements, it displays their icon and data on its user interface. You can launch the advertised service by clicking the displayed icon.

This section contains the following information:

Licensing for MSAP

The MSAP license is based on the number of service advertisements supported by the MSE. There are two types of MSAP license: the evaluation license and permanent license. The evaluation license is valid for 60 days and the permanent license is based on the MSE platform and the number of service advertisements supported.

Provisioning MSAP Service Advertisements

To add new MSAP advertisements, follow these steps:

Step 1 Choose **Services > MSAP**.

Step 2 From the Select a command drop-down list, choose **Add Service Advertisements**, and click **Go**.

The Service Advertisement Details page appears.

Step 3 Enter the service provider name in the Provider Name text box. It is the name of the provider who wants to provide advertisements to the client.

Step 4 Select an icon that is associated with the service provider by clicking the **Choose File**. This is the icon that is displayed on the client handset.

Adding Venue Policy to Service Advertisements

Note You can also apply service advertisements to a venue by choosing Services > MASP on the NCS UI. See the "Applying Service Advertisements to a Venue" section on page 16-100 for more information on how to apply service advertisements.

Step 5 Click **Add Venue** to specify at which venues you want the advertisements to be broadcasted on.

The Add/Edit Venue page appears.

Step 6 Enter the venue name in the Venue Name text box.

Step 7 From the Area Type drop-down list, choose the area type where you want to display the service advertisements. The possible values are **Floor Area** and **Outdoor area**.

Step 8 From the Campus drop-down list, choose the campus type where you want to display the service advertisements. The possible values are **System Campus** and **Site 5**.

Step 9 From the Building drop-down list, choose the building name where you want the advertisements to appear.

Step 10 From the Floor drop-down list, choose the floor type.

Note Depending on what floor you choose, the information in the Display near selected APs information changes.

Step 11 From the SSID drop-down list, choose SSIDs on which you want to broadcast the service advertisements. You can choose multiple SSIDs.

Step 12 Select the Display Rule radio button. You can select either the **Display everywhere** or **Display near selected APs** radio button. By default, Display everywhere radio button is selected.

If you select the Display everywhere radio button, then it searches for all the MSAP supported controllers that provide these SSID and assign these controllers to the MSE.

- If you select the Display everywhere radio button, then it searches for all the MSAP supported controllers that provide SSIDs and assigns these controllers to the MSE.

If you select the Display near selected APs radio button, then you can configure the following parameters:

- AP—Select those APs on which you want the advertisements to broadcast.
- Radio—Select the radio frequency on which you want the advertisements to be broadcasted on. The service advertisement is displayed when the mobile device is near the radio band that you have selected. The possible values are 2.4 GHz or 5 GHz.
- min RSSI—Enter a value for RSSI at which you want the service advertisements to display on the user interface.

Step 13 Click **Save** to add the venue. The venue is added to the list of venues on the Service Advertisement Details page.

Adding Service Brief Information to the Service Advertisement

Step 14 Click **Add Advertisement**.

The Add/Edit Advertisement page appears.

Step 15 From the Advertisement Type drop-down list, choose the type of advertisement you want to display.

Step 16 Enter the name that you want to display on the handset in the Friendly Name text box.

Step 17 Enter the service description in the Friendly Description text box.

Step 18 Enter the URL for each type of handset. The URL identifies the location at which the service can be retrieved. You can add multiple URLs by clicking **Add More URL**.

Step 19 Click **Save**. This information is applied to the MSE and the synchronization happens automatically.

Deleting Service Advertisements

To delete a service advertisement, follow these steps:

Step 1 Choose **Services > MSAP**.

The MSAP page appears.

Step 2 Select the check box of the service advertisement that you want to delete.

Step 3 From the Select a command drop-down list, choose **Delete Service Advertisement**, and click **Go**, or Click **Delete** in the MSAP page.

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

Applying Service Advertisements to a Venue

To apply service advertisements to a venue, follow these steps:

Step 1 Choose **Services > MSAP**.

Step 2 Select the check box of the service advertisement that you to apply to a venue.

Step 3 From the Select a command drop-down list choose **Apply to Venue(s)**.

Step 4 Click **Go**.

Step 5 Follow Step 6 through Step 13 in the Provisioning MSAP Service Advertisements, page 16-98.

or

Click **Apply** to Venues on the MSAP page and follow Step 6 through Step 13 in the Provisioning MSAP Service Advertisements, page 16-98.

Viewing the Configured Service Advertisements

To view the configured service advertisements, follow these steps:

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

Step 2 Click **Device Name** to view its properties.

The General Properties page appears.

Step 3 Choose **MSAP Service > Advertisements** from the left sidebar menu.

The following information appears in the MSAP Service page:

- Icon—Displays an icon associated with the service provider.
- Provide Name—Displays the service providers name.
- Venue Name—Displays the venue name.
- Advertisements
  - Friendly Name—Friendly name that is displayed in the handset.
  - Advertisement Type—Type of advertisement that is displayed in the handset.

Viewing MSAP Statistics

To view MSAP statistics, follow these steps:

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

Step 2 Click **Device Name** to view its properties.

The General Properties page appears.

Step 3 Choose **MSAP Service > Statistics** from the left sidebar menu.

The following information appears in the MSAP Service page:

- Top 5 Active Mobile MAC addresses—Displays information of the most active mobiles in a given venue.
- Top 5 Service URIs—Displays information of the usage of the services across a given venue or provider.

Viewing MSE Summary Page for MSAP License Information

See the "Mobility Services Engine (MSE) License Summary" section on page 15-137 for more information on MSE licensing.

Viewing Service Advertisements Synchronization Status

To view service advertisements synchronization status, follow these steps:

Step 1 Choose **Services > Synchronize Services**.

Step 2 Choose **Service Advertisements** from the left side menu bar.

The following information appears in the Service Advertisements page:

- Provider Name—Shows the name of the service provider.
- Service—Shows the type of service that a particular advertisement is using.
- MSE—Shows whether the service advertisement is synchronized with the MSE or not.
- Sync Status—Shows the synchronization status. A green two-arrow icon indicates that its corresponding element is synchronized with the given server such as MSE. A gray two-arrow icon with a red circle indicates that its corresponding item is not synchronized with a given server.
- Message—Shows any message related to the advertisement synchronization failure.

Adding an MSAP License Using the License Center

To add an MSAP license using the license center, follow these steps:

Step 1 Choose **Administration > License Center**.

Step 2 Choose **Files > MSE Files** from the left sidebar menu.

The License Center page appears.

Step 3 Click the **Add** to select the license file.

Step 4 Click **OK** to add the license.

The MSAP license is added.

MSAP Reports

You can generate 2 types of MSAP reports:

- Service URI Statistics—In this report, you can retrieve information about the top services that you have used based on the filters like venue, provider, mobile mac and MSAP servers. With this report, you can get the additional information about the usage of the services across a given venue. See the "Service URI Statistics" section on page 14-119 for more information on Service URI Statistics report.
- Mobile MAC Statistics—In this report, you can retrieve information about the most active clients based on the filters like venue and MSAP server. With this report, you can get additional information about the most active mobiles in a given venue. See the "Mobile MAC Statistics" section on page 14-118 for more information on Mobile Mac Statistics.

Identity Services

Cisco Identity Services Engine (ISE) is a next-generation identity and policy-based network access platform that enables enterprises to enforce compliance, enhance infrastructure security, and streamline their service operations.

NCS manages the wired and the wireless clients in the network. When Cisco ISE is used as a RADIUS server to authenticate clients, NCS collects additional information about these clients from Cisco ISE and provides all relevant client information to NCS to be visible in a single console.

Note NCS communicates with ISE using REST API. See the http://www.cisco.com/en/US/docs/security/ise/1.0/api_ref_guide/ise10_api_ref_guide_ch1.html for more information on Cisco ISE APIs.

Note Accounting data for wired clients are collected from ISE every 15 minutes. There is a background ISE Status task that polls all ISEs added to NCS for every 15 minutes for the status of ISEs and updates the status. See the "Viewing Identity Services Engine Status" section on page 15-18 for more information on viewing identity services engine status.

The ISE integration in NCS provides the following features:

- Periodic polling to ISE for collecting client statistics and other attributes requires for client list, dashboard charts, and reports.
- On demand query to ISE for getting additional client details such as Authorization Profile, Posture, Endpoint Type (profiler), and so on.
- Cross launch ISE user interface with automatic single sign on. See the "Identity Services Engine Reports" section on page 14-129 for more information.

See the "Cisco Identity Service Engine Solution" section on page 1-10 for more information on the ISE integration in NCS.

See the *Cisco Identity Services Engine User Guide, Release 1.0 at the following URL*: http://www.cisco.com/en/US/products/ps11640/products_user_guide_list.html for more information about ISE.

This section contains the following topics:

Viewing Identify Services

To see the Identity Services Engines that are added in NCS, choose **Services > Identity Services**. The following parameters appear:

- Server Address—IP address of ISE.
- Port—HTTPS port number for the server.
- Retries—Indicates the number of retry attempts.
- Version—Indicates the version of the ISE.
- Status—Indicates the reachability status, that is, Reachable or Unreachable.
- Role—Indicates if a node is a primary, standalone or, standby node.

Adding an Identity Services Engine

Note A maximum of two ISEs can be added in NCS. If you add two ISEs, one should be primary and the other should be standby. When you are adding a standalone node, you can add only one standalone node and cannot add second node.

To add an Identity Services Engine, follow these steps:

Step 1 Choose **Services > Identity Services**.

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

Step 3 In the Server Address text box, type the IP address of the server.

Step 4 In the Port text box, enter the port number of the server. The default is 443.

Step 5 In the Username text box, enter the username.

Step 6 In the Password text box, enter the password.

Step 7 Reenter the password in the **Confirm** Password text box.

Note The credentials should be superuser credentials. Otherwise, ISE integration does not work.

Step 8 In the HTTP Connection Timeout text box, enter the amount of time (in seconds) allowed before the process time outs. The default is 30 seconds.

Step 9 Click **Save**.

Removing an Identity Services Engine

To remove an Identity Services Engine, follow these steps:

Step 1 Choose **Services > Identity Services**.

Step 2 Select the check box(es) of the identity services engines that you want to delete.

Step 3 From the Select a command drop-down list, choose **Delete Identity Services Engine(s)**.

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