ULP EMS Operator Guide

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ULP EMS Operator Guide

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Revision History

Revision	Release Date	Change Description
01	December 10, 2010	Initial release of operator guide complete to system release 1.2.4.7.
02	December 13, 2010	Updated to be consistent with system release 1.2.5.2. Changes include: ■ Screenshots for active directory ■ Minor changes to procedure for adding and starting up APs
03	May 3, 2010	Updated to be consistent with system release 1.2.5.13. Changes include: ■ Updated screenshots ■ Minor changes to procedures for adding a Gateway (GW), an AP, and nodes ■ Expanded alarm table ■ Added section in alarm table for Audit Reporting
04	May 26, 2010	Updated to be consistent with system release 1.2.5.17. Changes include: ■ Updated screenshots ■ Added Email alert examples ■ Added Appendix B

1 Introduction

This document provides Element Management System (EMS) administrators and/or operators with the following information:

- EMS account configuration and maintenance.
- Ultra-Link Processing™ (ULP) network commissioning and configuration.
- ULP end device commissioning and configuration.
- Day to day network operation, including network alarm monitoring and network alarm acknowledgment.

This document does not provide EMS administrators and/or operators with the following information:

- Gateway hardware or software installation.
- Critical Infrastructure Monitoring Application (CIMA) hardware or software installation.
- EMS hardware or software installation.
- End device application descriptions.

Install and configure the software and/or hardware for each network component before using the instructions in this document.

NOTE: The On-Ramp Wireless Network Management System (NMS) software is going through the process of a name change from NMS to EMS (Element Management System). During this process, NMS and EMS are used interchangeably.

The following figure displays the EMS User Interface (UI) terminology.

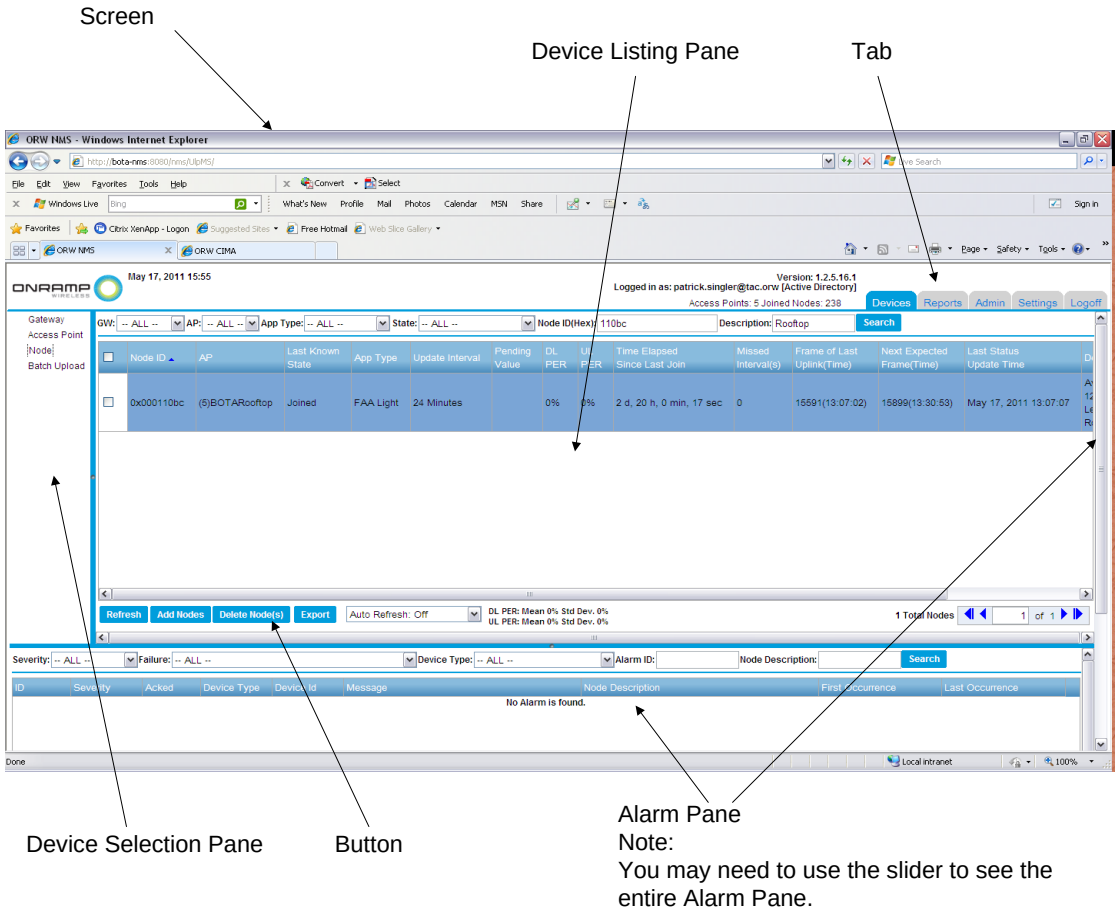


Figure 1. EMS UI Terminology

NOTE: The previous figure shows the EMS UI which contains panes and tabs with a drop-down list (**Auto Refresh: OFF**). Use this drop-down list to control the refresh rate of the screen.

2 ULP Network Overview

The On-Ramp Wireless ULP technology network monitors critical infrastructure devices in a wide-area territory. A network deployment contains many Access Points (APs) that are geographically distributed in a specific territory. The APs create a wireless network which monitors end devices. End devices can include:

- Federal Aviation Administration (FAA) obstruction light Remote Monitoring Units (RMUs)
- Distribution line Fault Circuit Indicators (FCIs)

The ULP network provides advantages for wide area sensor networking. The ULP network enables powered and battery operated Transmission and Distribution Smart and Remote Monitoring applications. The ULP network is deployed in an infrastructure efficient star topology and operates at -142 dBm receive sensitivity. Operating at this level provides a 40dB link budget advantage over competitive technologies. The ULP network, combined with a unique, multiple access scheme, services hundreds of thousands of sensors on a network. The ULP network is deployed in above-ground, pad-mount, and below-ground applications. The link budget advantage allows a ULP system to reliably operate in the unlicensed 2.4 GHz ISM band. This eliminates spectrum and recurring data service charges. The link budget advantage also provides utility companies with a network that meets the performance and security requirements of the critical infrastructure.

The following figure illustrates the functional overview of the ULP network.

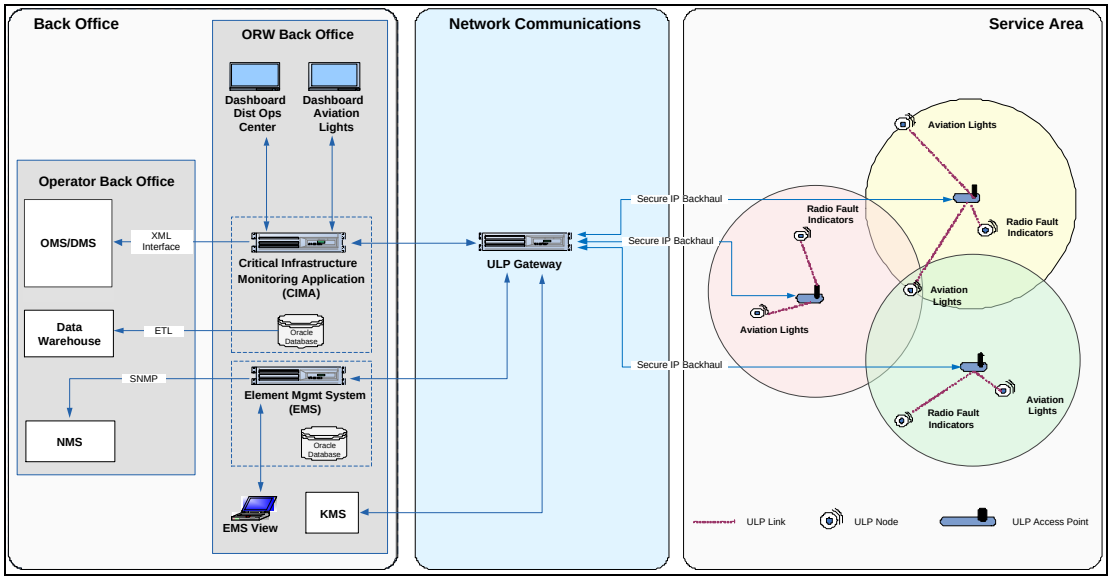


Figure 2. Functional Overview of the ULP Network

The On-Ramp Wireless EMS provides network control and alarm status for the ULP Gateway (GW), APs, and end devices in the network.

NOTE: Operators can use the On-Ramp Wireless CIMA and dashboard for application-level data collection and application alarms.

3 Maintaining and Operating the ULP Network

The following sections describe how to maintain and operate the ULP network through the On-Ramp Wireless EMS.

3.1 Logging in to the EMS

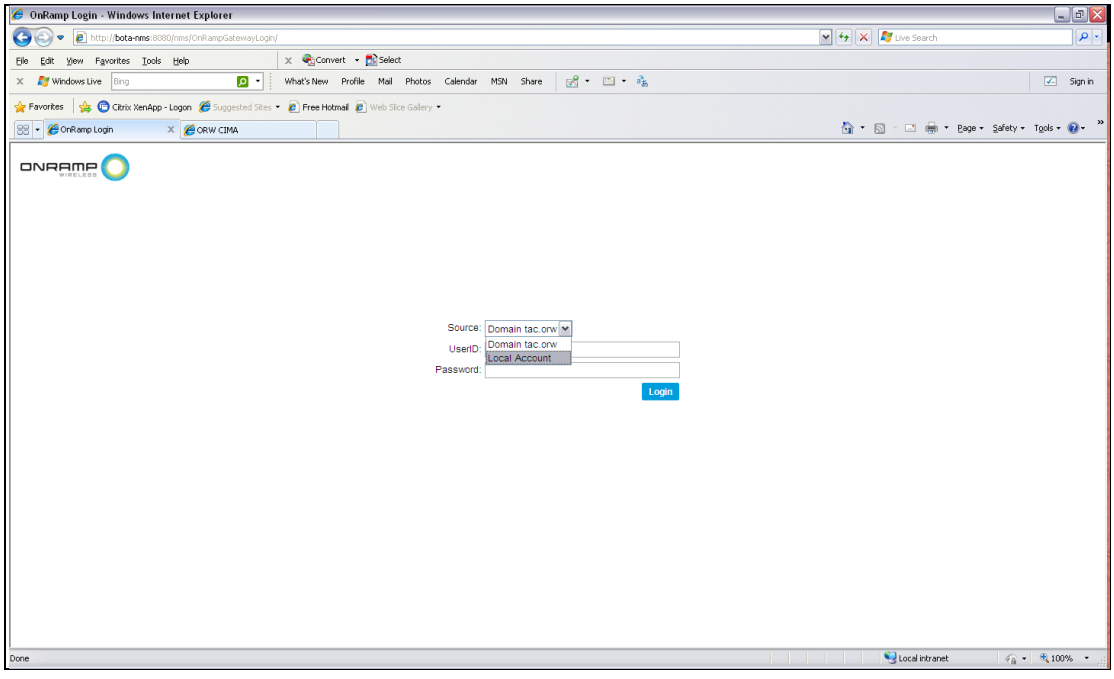
To log in to the EMS, complete the following steps:

1. Open a web browser, and type:

   `http://<ip address of the EMS server or DNS name>:8080/nms`

2. From the **Source** drop-down list, select **company Domain** or **Local Account**. Typically, it is expected that installations use the Active Directory.

   - Active Directory use is enabled during EMS installation. See the EMS Software Installation Guide for more information on Active Directory setup.
   - If the drop-down list is not visible, the Active Directory configuration is not set up. Log in with local account access with an account that was created in Maintaining a Local Account.



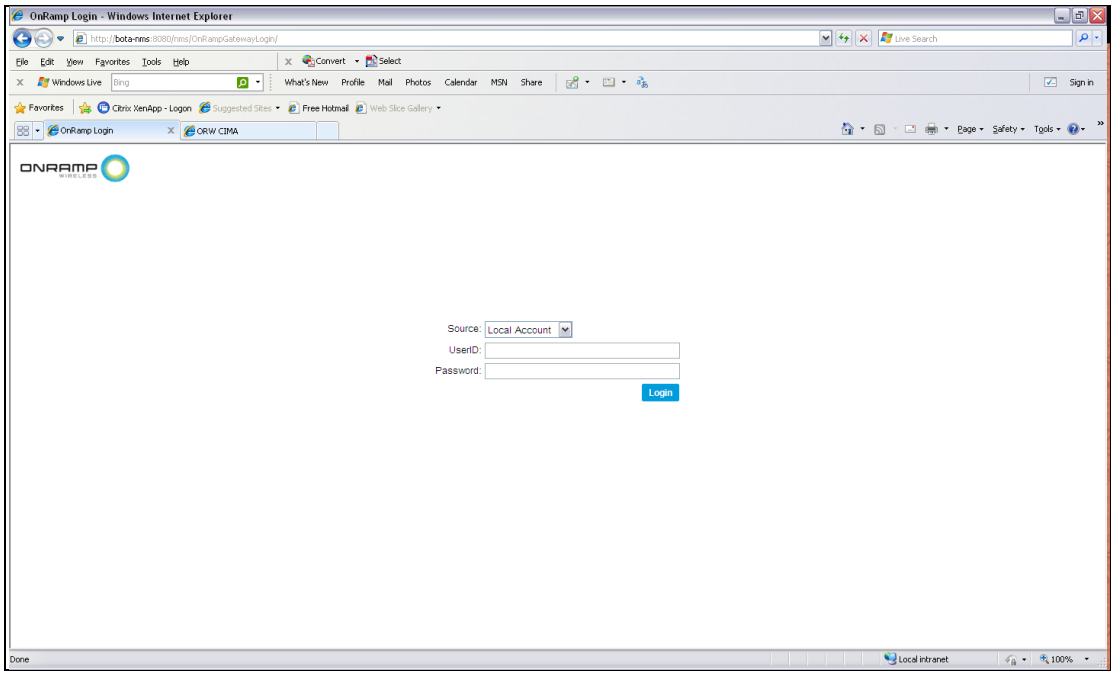
3. In the **UserID** field, type the user ID for this account.

   NOTE: Use the Active Directory account password when logging in to the EMS through the **company Domain**. If the **company Domain** is not active, use an account that was created in Maintaining a Local Account.

4. In the **Password** field, type the password for this account.

   NOTE: Use the Active Directory account password when logging in to the EMS through the **company Domain**. If the **company Domain** is not active, use an account that was created in Maintaining a Local Account.

5. Click **Login**.



3.2 Types of Accounts

The EMS contains the following types of accounts:

- Admin
- Operator
- Guest

When a user account is created, each additional account that is created in the EMS system is created as an admin, an operator, or a guest account. These account types exist for both Local Accounts and Active Directory enabled systems.

- When configuring Local Accounts, the Local Account administrator creates and maintains the accounts.
- When using Active Directory, the company's Information Technology (IT) group is responsible for setting up the EMS accounts. In this case, accounts are created according to account type (admin, operator, or guest) and are mapped to the Active Directory. For more information, see the EMS Software Installation Guide.

The following sections describe each type of account in the EMS.

Administrator Account

In new EMS installations that are not using Active Directory controlled logins, the administrator (admin) account is the only default account available. The admin account only manages accounts created in Local Accounts. If using Active Directory, the internal company's IT group maintains the account. For **Local Account** login, the default UserID is *admin*, and the default password is *onramp*.

The administrator account has complete control over the network configuration, network operation, and Local Account administration. When using Active Directory, the IT group that controls the Active Directory also controls the creation of accounts. If this is the first time that a system administrator logs in to the EMS system, the system administrator should change the default account password for the local default admin account.

It is recommended that the administrator:

- Change the default password for the local default admin account.
- Create an account for all other EMS operators that have access to the system and do not regularly use the default admin account for day to day operations, when using Local Accounts.

For day to day operations in the EMS system, it is recommended that the administrator create operator type accounts.

Operator Account

The operator type of account allows operators to configure the network end device network parameters. If operators log in to the system as a user with this type of account, EMS account administration cannot be performed.

Guest Account

The guest type of account allows guest account users to monitor the network operation.

When logging in to the EMS, different tabs display for different types of accounts. For example, when logging in to the EMS with an administrator account, the tabs that display are different than those of a read-only account.

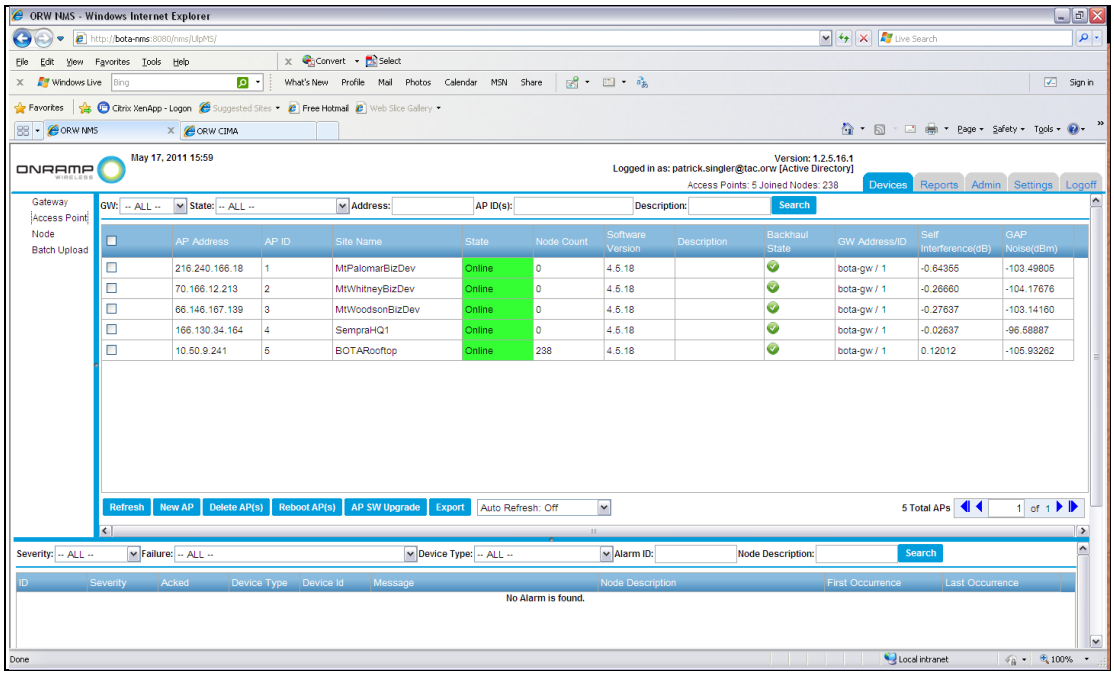
3.3 Maintaining a Local Account

The following sections describe how to add and edit local user accounts in the EMS.

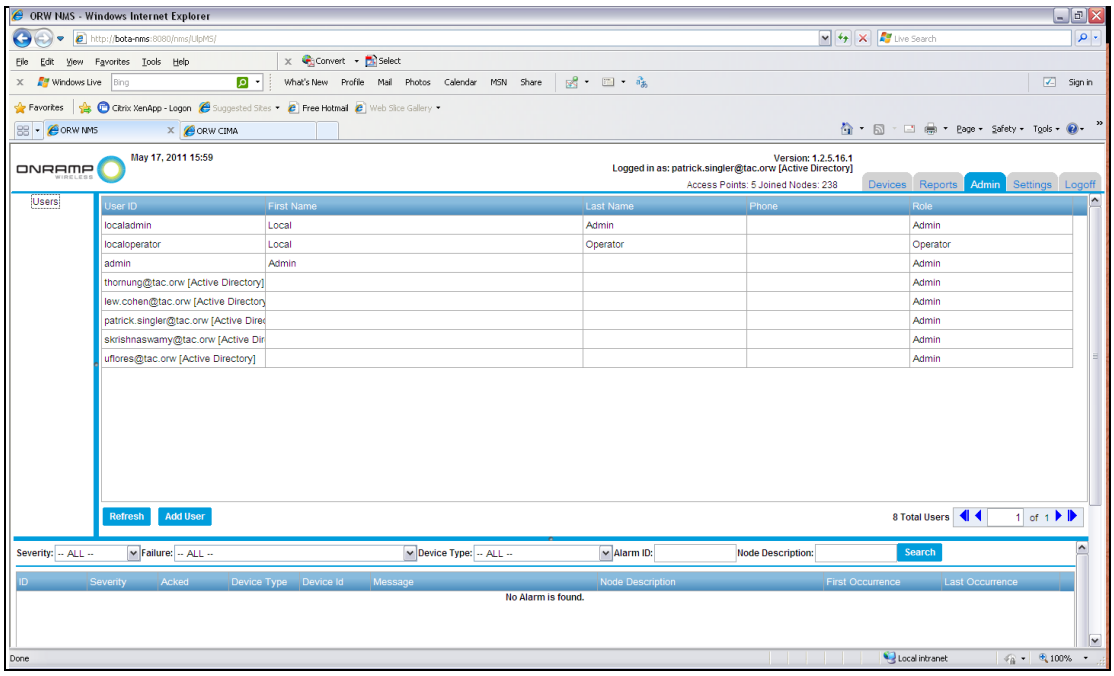
3.3.1 Adding a User Account

To add a local EMS user account, log in with an administrator account, and complete the following steps:

1. On the login screen, click the **Admin** tab.



2. Click **Add User**.



3. In the **User ID** field, type the user ID for this account. This is the same user ID that is entered when logging in to the EMS with this new account.
4. In the **First Name** field, type the first name of the user for this account.
5. In the **Last Name** field, type the last name of the user for this account.
6. In the **Password** field, type the password for this account.
7. In the **Confirm Password** field, confirm the password entered above.
8. In the **Phone** field, type the phone number for the user for this account.
9. From the **Assigned Role** drop-down list, select the account type to use for this account.
10. Click **Save**.

NOTE: A pop-up window may display depending on the password complexity used in Step 6 and Step 7 above. Make sure that the assigned password meets the password complexity rules as described in the pop-up window.

3.3.2 Editing a User Account

To edit a user account, complete the following steps:

1. Log in to the EMS with an administrator account.
2. Click on the account to edit.
3. Change the account information.
4. Click **Save**.

3.4 Configuring the ULP Network

To configure the ULP network, configure and commission the following ULP elements:

- Gateway
- APs
- End devices (nodes)

To configure the ULP network, log in with an admin or configure account. When logging in with a read-only account, the ULP network cannot be configured.

Operators can use the following methods to initialize the network:

- Ingest file
- Manual configuration

Operators can use a combination of these methods to initialize a network. For example, an operator can start to initialize a network deployment of a small number of APs and nodes with an ingest file. As APs and nodes are added to the network, the operator can add them through a manual configuration.

The method in which operators use to initialize a network depends on the following items:

- Complexity of the operator's network
- Availability of site-specific information at the time of initialization

3.4.1 Configuring the Network with the Ingest File - Initialization Steps

To configure the ULP network with the ingest file method, the operator must first have a valid ingest file. On-Ramp Wireless provides operators with a valid ingest file to configure the ULP network. The following example describes how to bring up a network from a single ingest file that contains information for a Gateway and an AP.

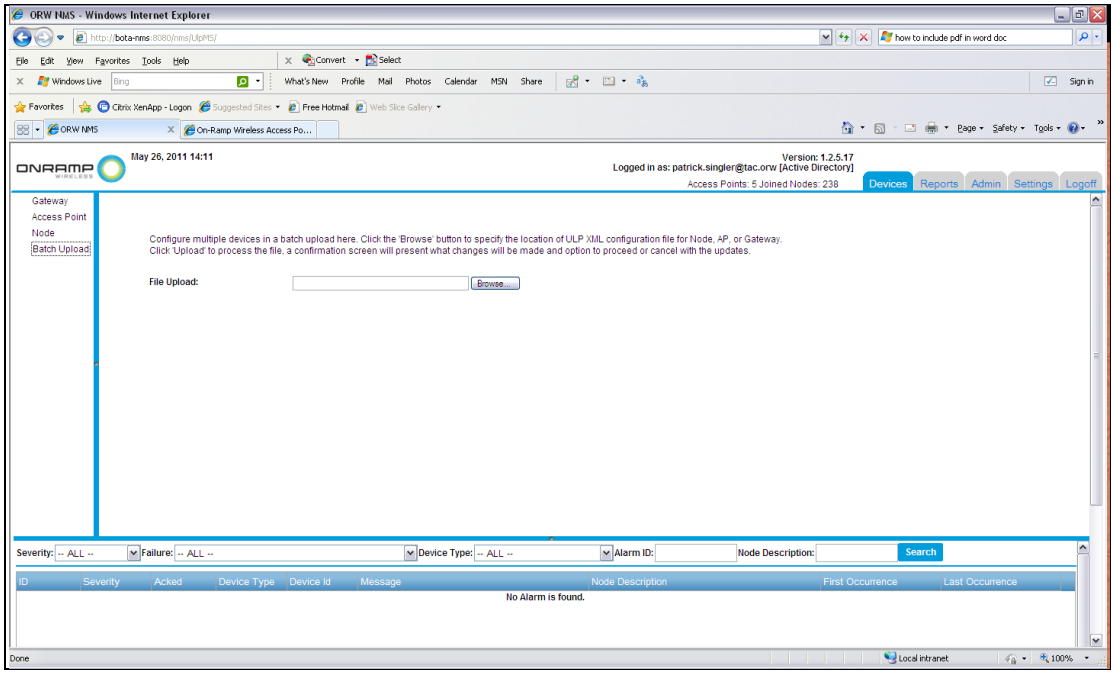
To use the valid ingest file, complete the following steps:

1. Read in an ingest file to configure the Gateway.
2. Read in an ingest file to configure the AP.
3. Read in an ingest file to configure the end device.

3.4.2 Configuring the Gateway with the Ingest File

To configure the Gateway with the ingest file, complete the following steps:

1. Log in to the EMS with an admin account.
2. Click the **Devices** tab.
3. In the Devices pane, click **Batch Upload**.



4. Click **Browse**, and navigate to the location of the ingest file.
5. Click **Upload**.
6. Click **Save**. The pop-up window asks the operator to confirm the configuration of the Gateway.
7. Click **Yes**.

3.4.3 Restarting the Gateway

After uploading the ingest batch file, restart the Gateway.

To restart the Gateway, complete the following steps:

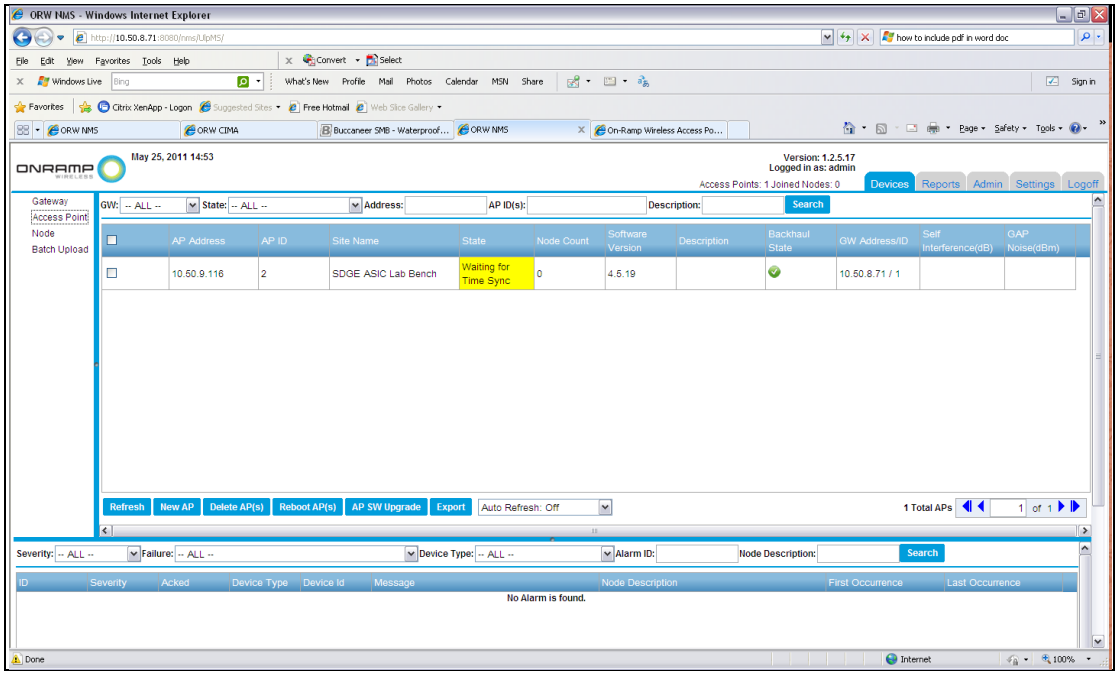
1. In the Devices pane, click **Gateway**.
2. Select the Gateway to restart, and click **Restart Gateway**. The pop-up window asks the operator to confirm the restart.
3. Click **Yes**.

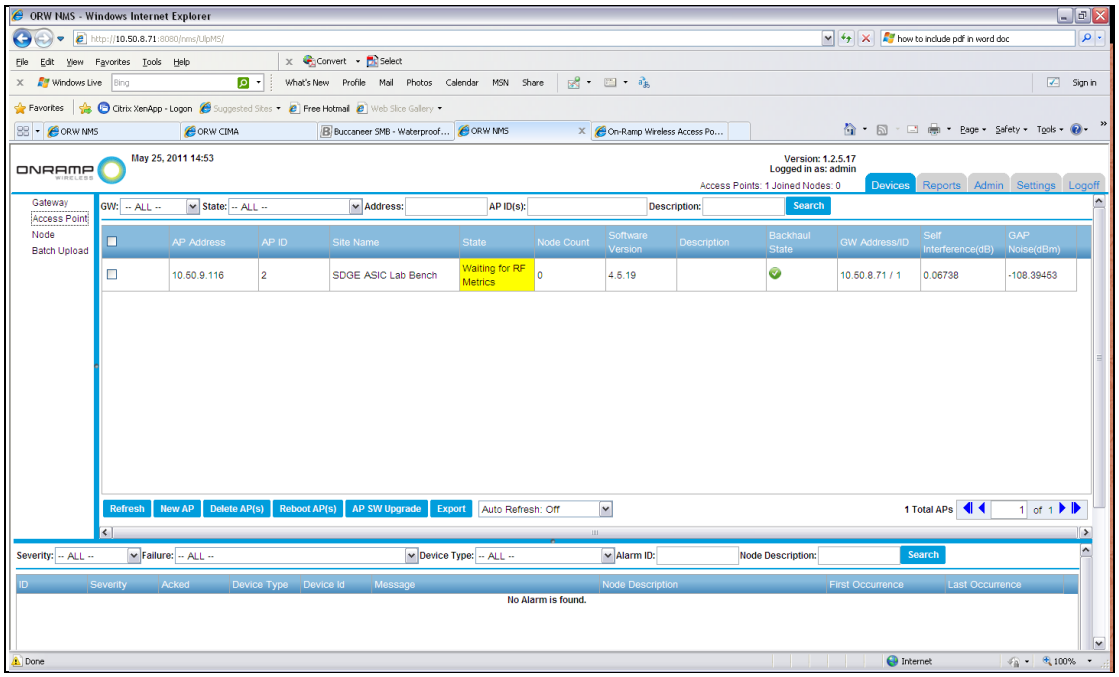
3.4.4 Configuring Access Points with the Ingest File

To configure access points with the ingest file, complete the following steps:

1. Log in to the EMS with an admin account.
2. Click the **Devices** tab.
3. Click **Batch Upload**.
4. To start the AP, reload the configuration file, upload, save, and confirm the upload.
5. To confirm the status of the AP, select **Devices → Access Point** in the Devices pane.

NOTE: The EMS AP status does not update immediately. Eventually, the status shows that the AP has transitioned to a yellow state. Alternatively, the operator can click **Refresh** from the Access Point Device Listing screen. Depending on when the screen is refreshed, the operator will see **Waiting for Time Sync** or **Waiting for RF Metrics** display in the **State** field. This is normal behavior for an AP that is transitioning from an offline state to an online state. The AP goes through an initialization period in which it first finds GPS and then measures the RF noise that the AP experiences. During this process, the AP adjusts the RF behavior accordingly. Typically, this adjustment takes approximately 2.5 minutes to complete.


ORW NMS - Windows Internet Explorer
May 25, 2011 14:53
Version: 1.2.5.17
Logged in as: admin
Access Points: 1 Joined Nodes: 0
Devices
Reports
Admin
Settings
Logoff
Gateway
Access Point
Node
Batch Upload
GW: -- ALL --
State: -- ALL --
Address:
AP ID(s):
Description:
Search
AP Address
AP ID
Site Name
State
Node Count
Software Version
Description
Backhaul State
GW Address/ID
Self Interference(dB)
GAP Noise(dBm)
10.50.9.116
2
SDGE ASIC Lab Bench
Waiting for Time Sync
0
4.5.19
10.50.8.71 / 1
Refresh
New AP
Delete AP(s)
Reboot AP(s)
AP SW Upgrade
Export
Auto Refresh: Off
1 Total APs
Severity: -- ALL --
Failure: -- ALL --
Device Type: -- ALL --
Alarm ID:
Node Description:
Search
ID
Severity
Acked
Device Type
Device Id
Message
Node Description
First Occurrence
Last Occurrence
No Alarm is found.


ORW NMS - Windows Internet Explorer
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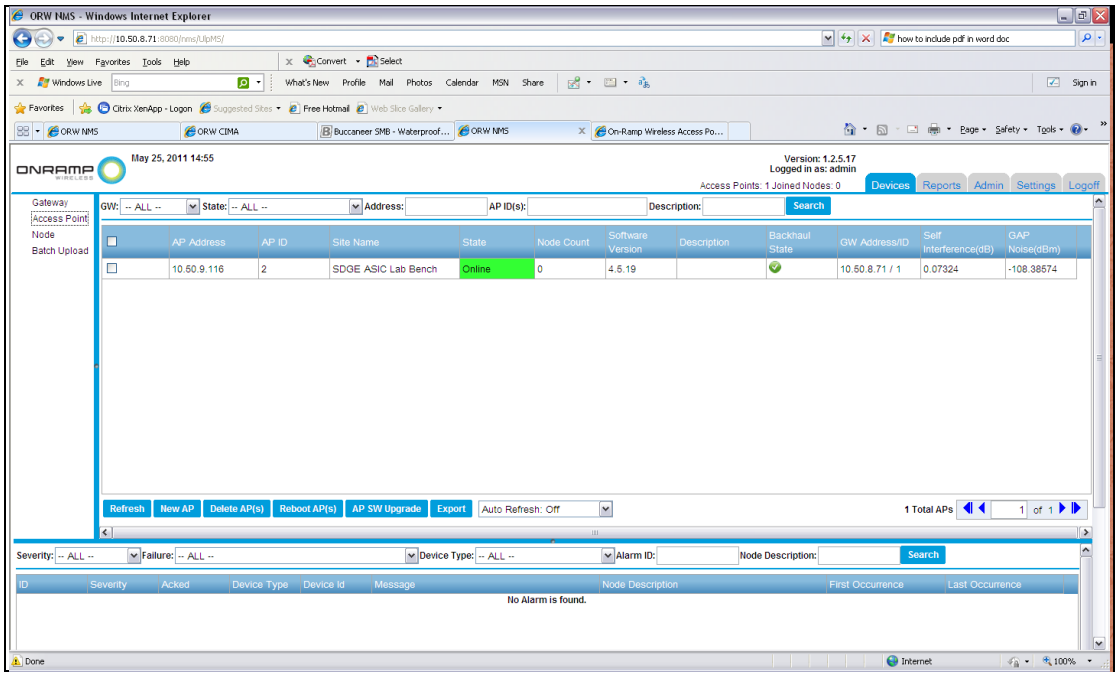
Version: 1.2.5.17
Logged in as: admin
Access Points: 1 Joined Nodes: 0
Devices
Reports
Admin
Settings
Logoff
Gateway
Access Point
Node
Batch Upload
GW: -- ALL --
State: -- ALL --
Address:
AP ID(s):
Description:
Search
AP Address
AP ID
Site Name
State
Node Count
Software Version
Description
Backhaul State
GW Address/ID
Self Interference(dB)
GAP Noise(dBm)
10.50.9.116
2
SDGE ASIC Lab Bench
Waiting for RF Metrics
0
4.5.19
10.50.8.71 / 1
0.06738
-108.39463
Refresh
New AP
Delete AP(s)
Reboot AP(s)
AP SW Upgrade
Export
Auto Refresh: Off
1 Total APs
Severity: -- ALL --
Failure: -- ALL --
Device Type: -- ALL --
Alarm ID:
Node Description:
Search
ID
Severity
Acked
Device Type
Device Id
Message
Node Description
First Occurrence
Last Occurrence
No Alarm is found.

6. After the AP adjusts the GPS time sync and RF Metrics, the AP transitions from a yellow state to a green state as shown below.



3.5 Configuring the Network Manually

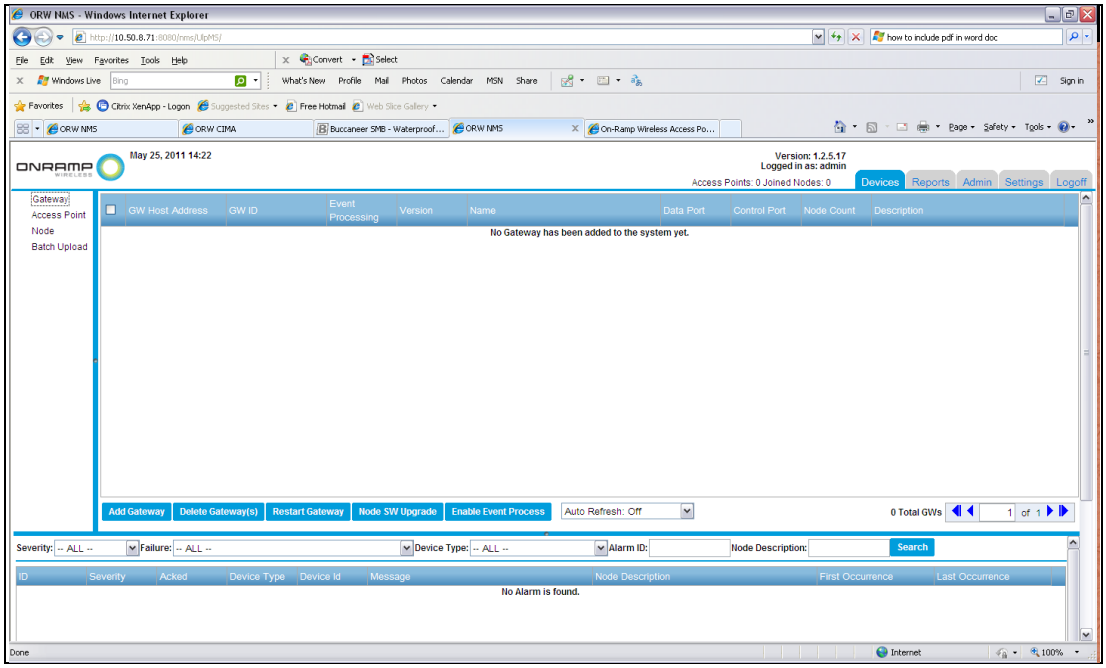
The following sections describe how to perform a manual network configuration.

3.5.1 Adding the Gateway

The ULP Gateway is the point of entry for configuring the ULP network. After logging in to the EMS, add the Gateway before configuring the other ULP elements, such as APs and/or Nodes.

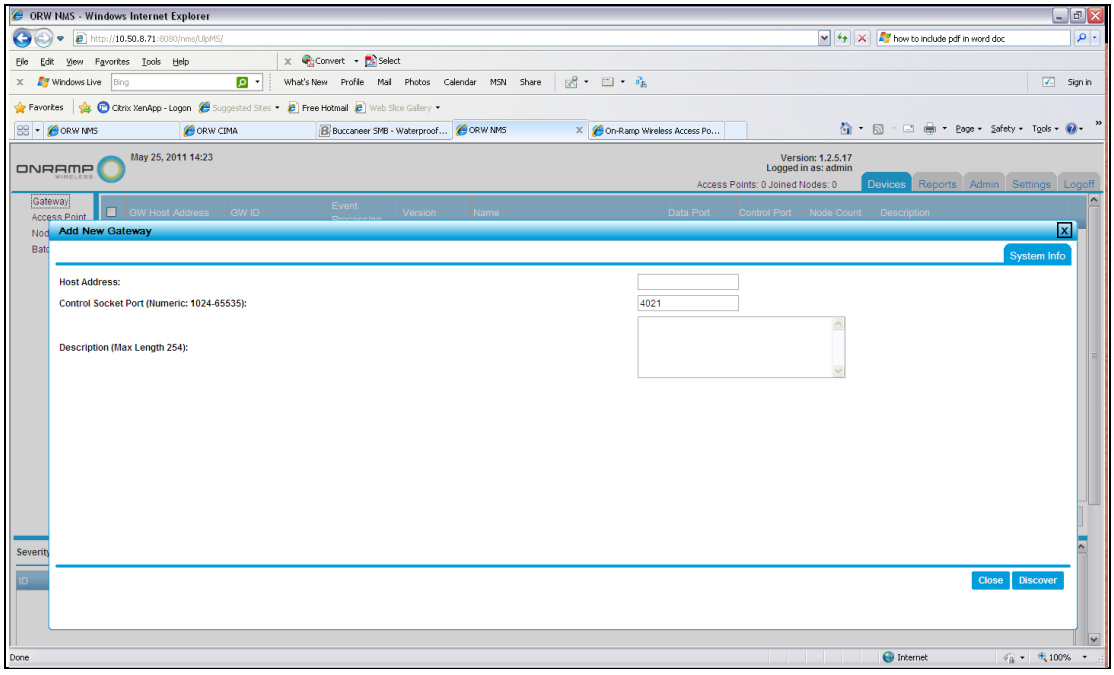
To add and/or configure the Gateway, complete the following steps:

1. After logging in to the EMS, click the **Devices** tab, and select **Gateway** from the Device Selection pane.



NOTE: For a new network, preconfigured Gateways, access points, and/or nodes will not be displayed.

2. Click **Add Gateway**.



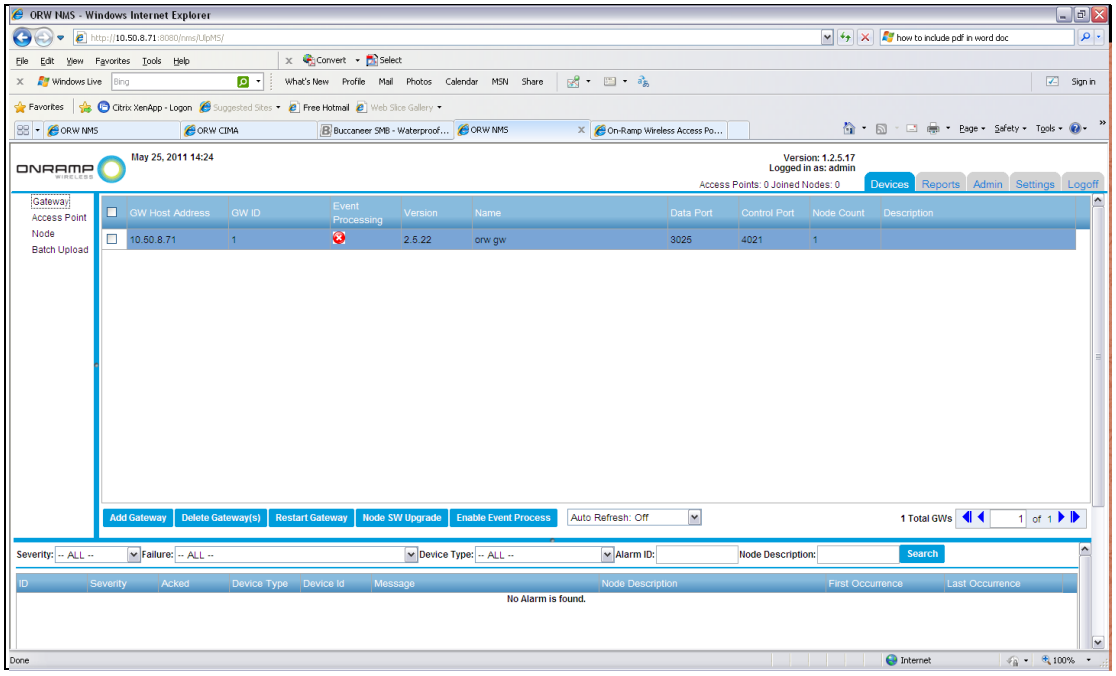
3. In the Add New Gateway window, complete the information for the following fields.
   a. In the **Host Address** field, type the IP address (or DNS resolvable name) for the machine running the ULP Gateway.
   b. In the **Control Port** field, the default value is 4021. Do not change this value.
   c. Optional: In the **Description** field, type a description for the Gateway. The description can be any user-specific information, such as physical location or internal name for the Gateway.
4. Click **Discover**. A warning box displays alerting that the Gateway will not be updated in the EMS until the Gateway is enabled.
5. Click **OK**.

3.5.2 Configuring ULP Network Parameters

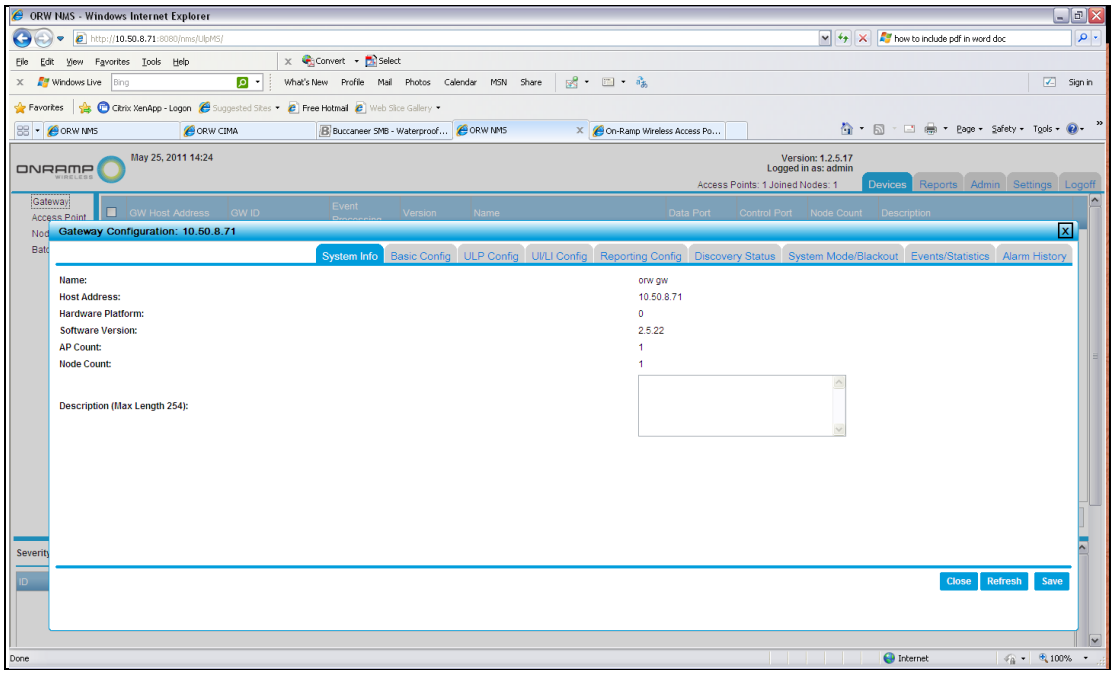
Operators must configure ULP network parameters before enabling the Gateway in the system.

To configure the ULP network parameters, complete the following steps:

1. In the Devices selection pane, select **Gateway**. The Gateway that was added is displayed.

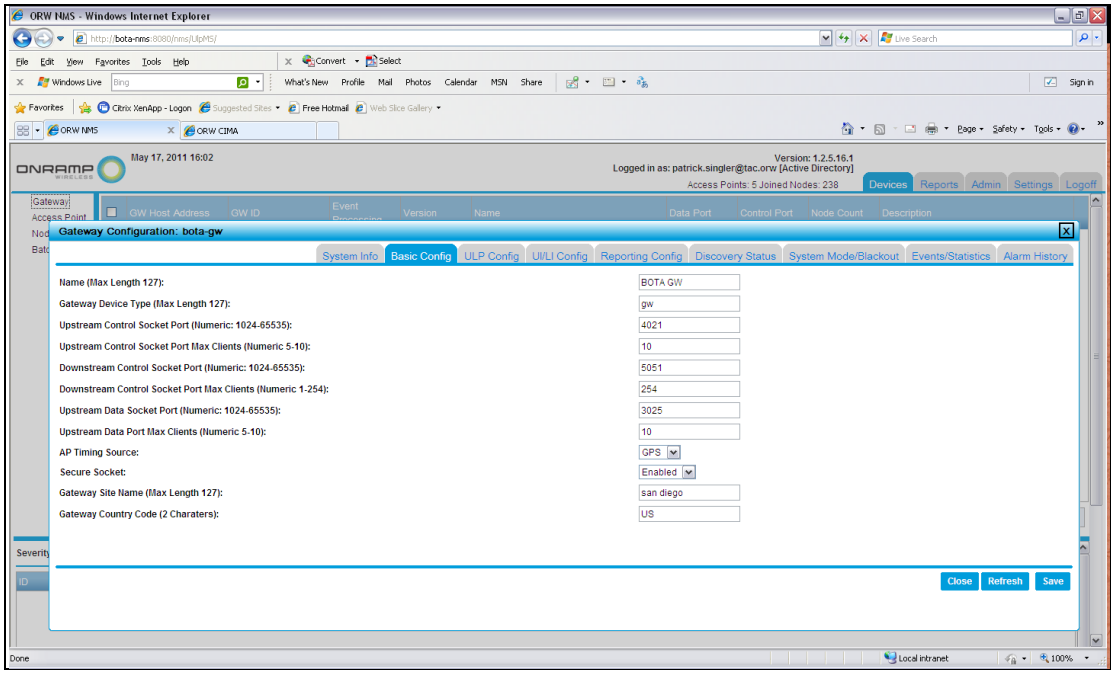


2. In the Device selection pane, click on the GW ID of the Gateway that was added. The Gateway Configuration window is displayed.



3. Optional: In the **Description** field, type a description for the Gateway. The description can be any user-specific information, such as physical location or internal name for the Gateway.

4. Click the **Basic Config** tab.



5. In the Gateway Configuration window, complete the information for the following fields.
   a. In the **Name** field, type a descriptive name for this Gateway.
   b. In the **Gateway Device Type** field, type **gw**.
   c. In the **Upstream Control Socket Port (Numeric: 1024-65535)** field, the default value is 4021. If the network does not use the default value, update the port value.
   d. In the **Upstream Control Socket Port Max Clients (Numeric 5-10)** field, type 10.
   e. In the **Downstream Control Socket Port (Numeric: 1024-65535)** field, type 5051.
   f. In the **Downstream Control Socket Port Max Client (Numeric: 1-254)** field, type 254.
   g. In the **Upstream Data Socket Port (Numeric: 1024-65535)** field, type 3025.
   h. In the **Upstream Data Port Max Clients (Numeric 5-10)** field, type 10.
   i. In the **AP Timing Source** field, select **GPS** from the drop-down list.
   j. In the **Secure Socket** field, select **enabled** from the drop-down list.
   k. In the **Gateway Site Name (Max Length 127)** field, type the site name for the Gateway.
   l. In the **Gateway Country Code (2 Characters)** field, type the country code for the Gateway.
   m. Click **Save**.

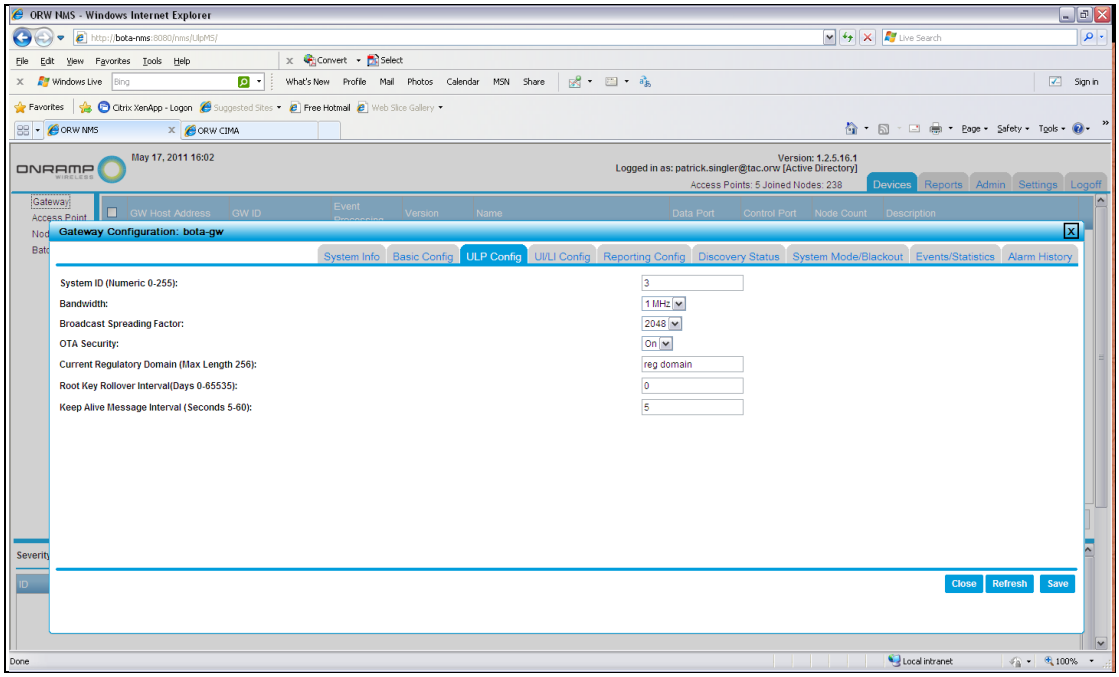
   NOTE: If the operator has not changed any of the default settings and has clicked **Save**, the following warning displays:

   Cannot save configuration. No change has been made.

   If changes have been made, a pop-up window asks for confirmation to restart. Additionally, there is a place to enter an optional note about this configuration change. All EMS configuration changes are logged to an audit report. The information here is logged in this report with the configuration change.

6. The pop-up window asks the operator to confirm the restart.
7. Click **Yes**. The pop-up window asks the operator to confirm the restart.
8. Click **Yes**.
9. In the Device selection pane, click on the GW ID of the Gateway that was added. The Gateway Configuration window is displayed.

10. Click the **ULP Config** tab.



11. In the Gateway Configuration window, complete the information for the following fields.

    a. In the **System ID (Numeric 0-255)** field, type the operator-specific System ID that matches the operator's network system ID.

    b. In the **Bandwidth** field, the default value (1MHz) is selected from the drop-down list. Do not change this value.

    c. In the **Broadcast Spreading Factor** field, select **2048** from the drop-down list. The default value is 2048.

    d. In the **OTA Security** field, select **On** from the drop-down list.

    NOTE: Typically, for a production system, select **On**. For a lab and/or a developmental system, the operator may optionally select **Off**.

    If **OTA Security** is turned **On**, the operator must provision Gateway and node keys for the operator's system to function properly. For information on how to set up security keys, see the KMS User Guide.

    The Key Management Server (KMS) should be up and running before configuring other pieces of the system.

    e. In the **Current Regulatory Domain (Max Length 256)** field, type the name of the operator's current regulatory domain.

    f. In the **Root Key Roller Interval (Numeric 0-65535)** field, type 30.

    NOTE: Based on the operator's local information security requirements, this number may be different from the default number (30). If it is different, enter it now.

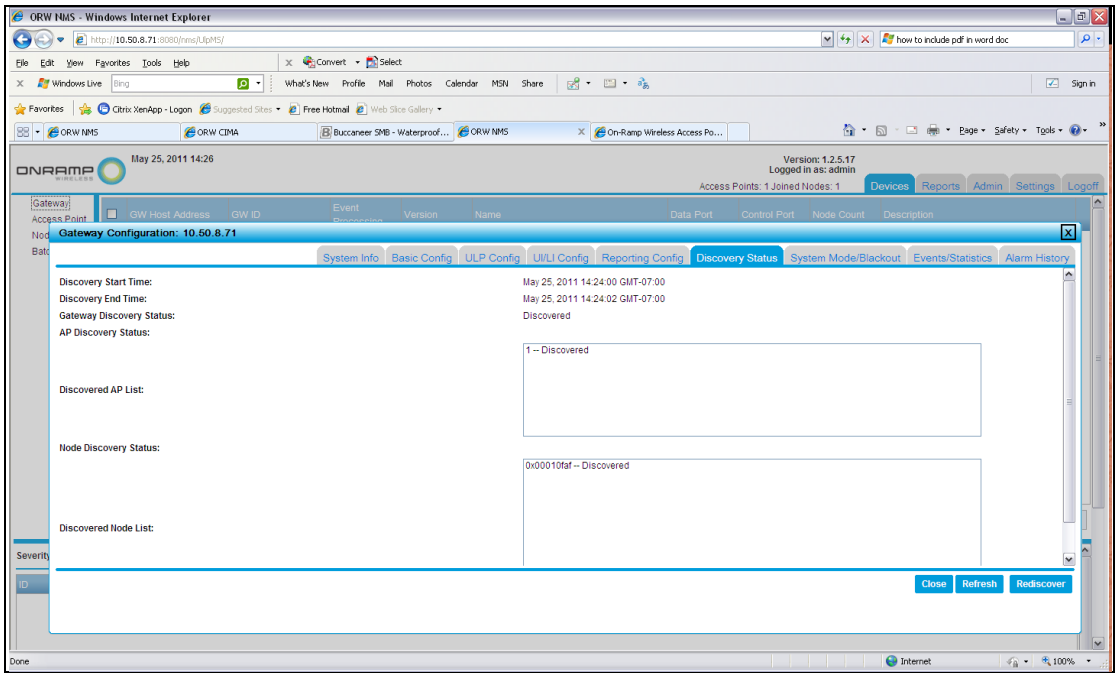
g. In the **Keep Alive Message Interval (Seconds 5-60**) field, type 5.

NOTE: This parameter affects the generation of the GW Health alarm that the EMS generates. If the GW has not generated a keep alive signal within 3*<number of seconds> in this field, the GW Health alarm will be triggered.

12. Click **Save**.

NOTE: A pop-up window asks the operator to confirm the restart. Additionally, there is a place to enter an optional note about this configuration change. All EMS configuration changes are logged to an audit report. The information here is logged in this report with the configuration change.

13. A second pop-up window asks the operator to confirm the restart.
14. Click **Yes**. The pop-up window asks the operator to confirm the restart.
15. Click **Yes**.
16. In the Device selection pane, click on the GW ID of the Gateway that was added. The Gateway Configuration window is displayed.
17. Click the **Discovery Status** tab.



NOTE: If this is the first time the Gateway has been discovered, the lists and status will be empty.

18. Click **Rediscover**.

    NOTE: A pop-up window asks the operator to confirm the discovery of the Gateway. Additionally, there is a place to enter an optional note about this configuration change. All EMS configuration changes are logged to an audit report. The information here is logged in this report with the configuration change.

19. Click **Yes.**
20. Click **Close**.

3.5.3 Enabling the Gateway

To enable the Gateway, complete the following steps:

1. In the Device Selection pane, select **Gateway.** Then, select the check box next to the Gateway ID of the Gateway that was just added.
2. Click **Enable Event Process**.
3. Optional: Type a note in the confirmation box to track this event in the audit report.
4. Click **Yes**.

3.5.4 Configuring an Access Point

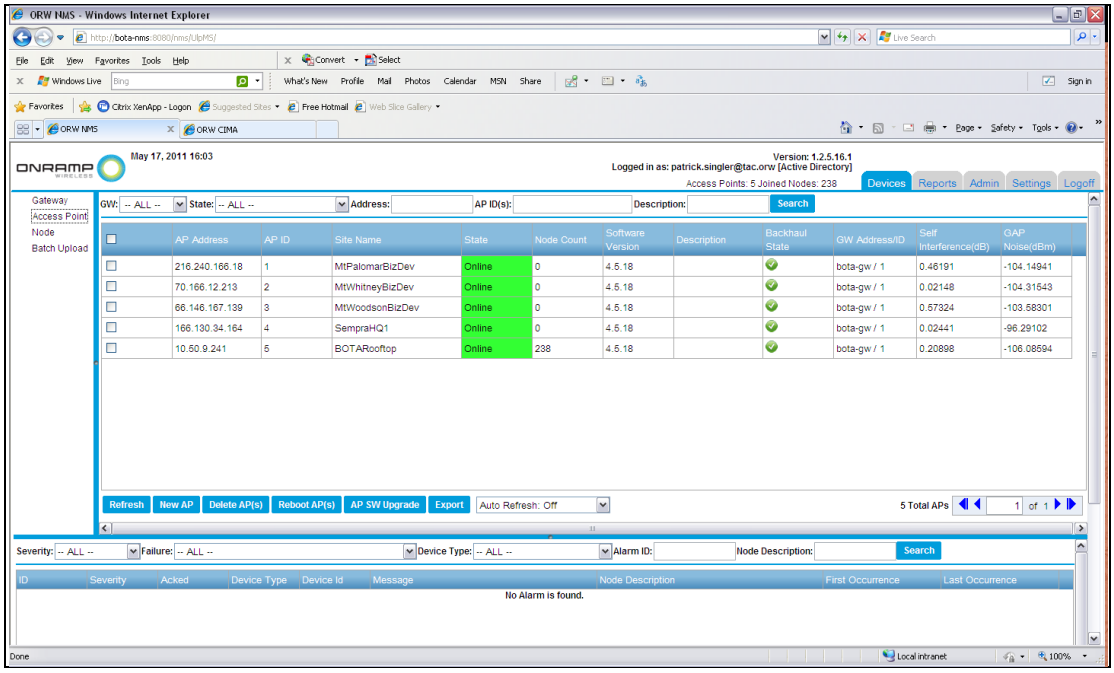
APs are geographically dispersed throughout a wide territory and communicate upstream and downstream.

- Upstream: APs communicate upstream with the Gateway through Transmission Control Protocol/Internet Protocol (TCP/IP) over various types of physical backhauls. The physical backhauls are based on the specifics of the network deployment. A typical backhaul might consist of a leased line and/or microwave.
- Downstream: APs provide a wireless coverage footprint for thousands of wireless end-point devices and/or nodes.

To configure an AP, complete the following steps:

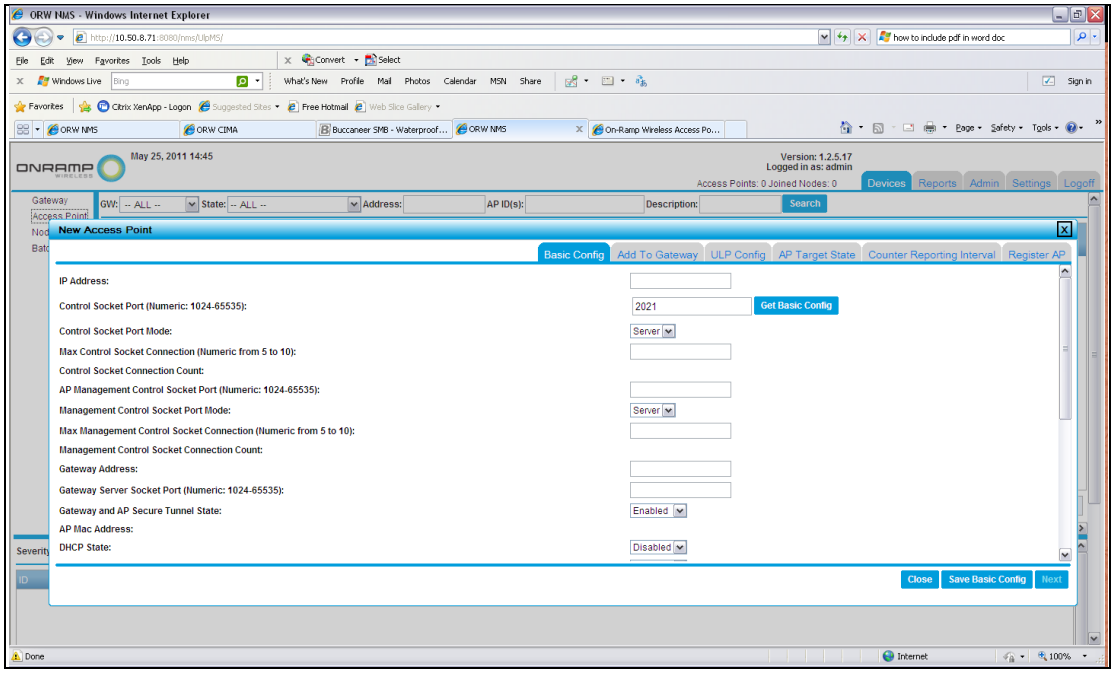
1. Make sure that the operator has the following AP site survey information:
   a. IP Address (or DNS resolvable name)
   b. Channel Number
   c. Reuse Code
2. Log in to the EMS with the admin or configure account.
3. Make sure that a Gateway is enabled.
4. Click the **Devices** tab.

5. In the Device selection pane, select **Access Point**.



NOTE: If this is the first time adding an AP, this page will be blank. If adding multiple APs, the APs that were added are displayed in this list.

6. Click **New AP**.



7. In the **IP Address** field, type the IP address for the AP to be added.

8. In the **Control Socket Port (Numeric: 1024-65535)** field, type 2021.

   NOTE: If the operator has different port information from the site survey, the operator must type a different control socket port number.

9. In the **Control Socket Port Mode** field, **Server** is selected from the drop-down list. Do not change this value.
10. Click **Get Basic Config**.

    NOTE: This step forces the EMS to obtain the default settings for this AP from the AP itself. If these values are correct, the operator can use them. If these values are not correct, the operator can update them in the next steps.

11. Complete the information for the following fields or make changes as appropriate for the operator's site.
    a. In the **Max Control Socket Connection (Numeric from 5-10)** field, type 5.
    b. In the **AP Management Control Socket Port (Numeric: 1024-65535**) field, type 2022.

       NOTE: If the operator has different port information from the site survey, the operator must type a different control socket port number.

    c. In the **Management Control Socket Port Mode** field, select **Server**.
    d. In the **Max Management Control Socket Connection (Numeric from 5-10)** field, type 5.
    e. In the **Gateway Address** field, leave the default value.
    f. In the **Gateway Server Socket Port (Numeric: 1024-65535)** field, type 5051.
    g. In the **Gateway and AP Secure Tunnel State** field, select **Enabled** from the drop-down list.

       NOTE: The Disabled option is available for test and development systems or lab systems only. All production systems use security.

    h. In the **DHCP State** field, select **Disabled**.
    i. In the **Telnet State** field, select **Disabled**. This is an additional test system and/or lab system deployment feature that is not typically enabled in production systems.
    j. In the **Default Router** field, leave the default setting.
    k. In the **Netmask** field, leave the default setting.
    l. In the **Name Server(s)** field, leave the default setting.
    m. In the **NTP Server(s)** field, leave the default setting.
    n. Optional: In the **AP Site Name (Max 255 characters)** field, type a description for this AP.
    o. Optional: In the **Backhaul Type** field, type a description of the type of TCP/IP backhaul that the AP uses.
    p. Optional: In the **Country Code(2 letters)** field, type a 2 letter country code.

12. Click **Save Basic Config**.

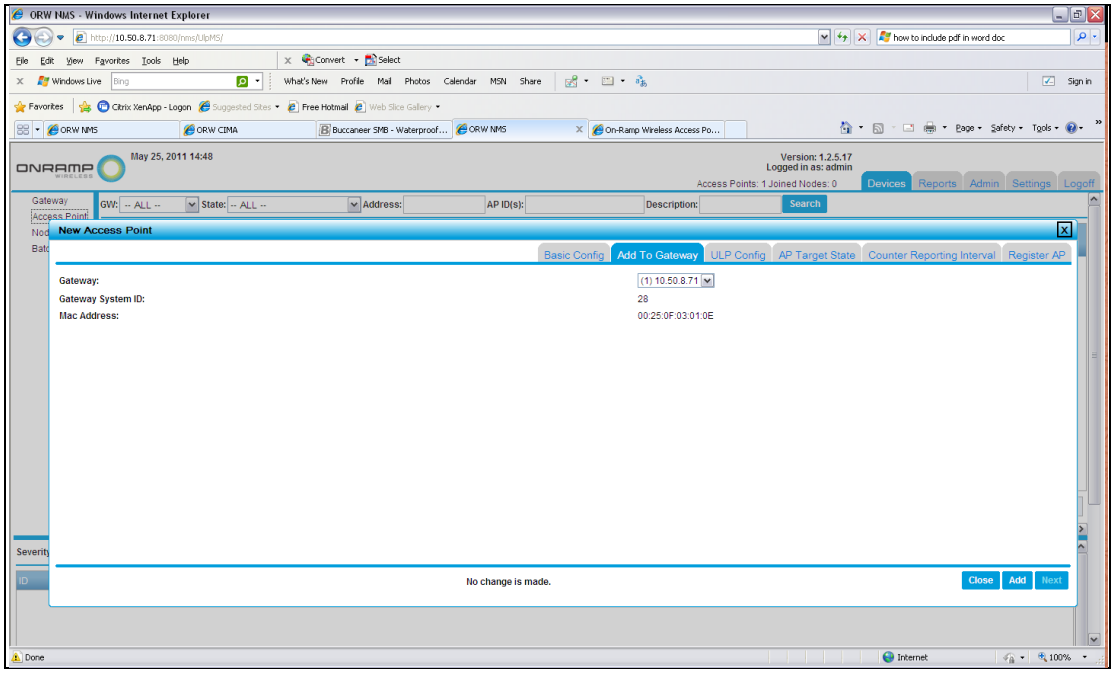
    NOTE: If changes were not made, the screen displays no changes made.

    If changes were made, a pop-up window allows the operator to enter a description of this event. This description will be entered into the system's audit report for future tracking of when changes were made to the system.

13. In the Update Notification pop-up window, click **Yes**.

    NOTE: If changes were made to the configuration, the AP will reboot. Confirm to reboot the AP and add an optional audit report log. The operator must wait for the AP to reboot.

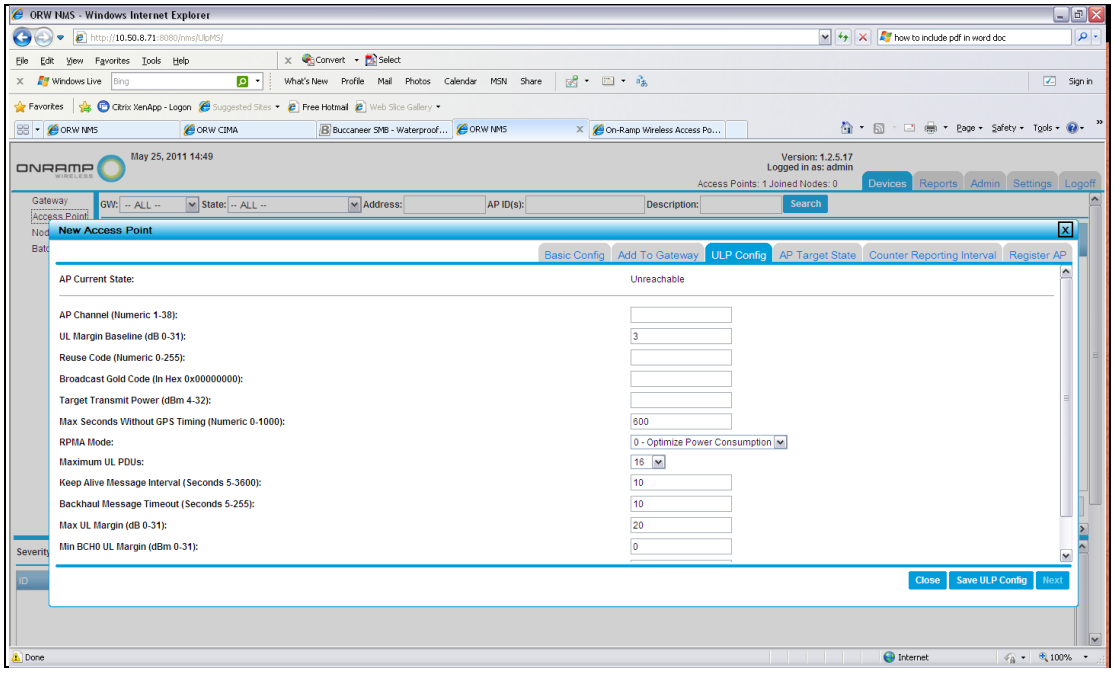
14. Click **Next**. The **Add To Gateway** tab is active.



15. Click **Add**. The pop-up window asks the operator to confirm the addition. A pop-up window also allows the operator to enter a description of this event. This description will be entered into the system's audit report for future tracking of when changes were made to the system.

16. Click **Yes**.

17. Click **Next**.



18. In the new Access Point window, complete the following field entries using the company specific site template. If the company template overrides defaults listed below, enter them when updating these fields.

    a. In the **AP Channel (Numeric 1-38)** field, type the channel of this AP from the site-specific template.

    b. In the **UL Margin (Numeric 0-15)** field, type 2.

    c. In the **Reuse Code** field, type information from the site-specific template.

    d. The **Broadcast Gold Code** field is grayed out on purpose as this field is auto-generated.

    e. In the **Target Transmit Power (In dBm 4-32)** field, type information from the site-specific template.

    f. In the **Max Seconds Without Timing (Numeric: 0-1000)** field, type 600.

    g. In the **RPMA Mode** field, enter information from the site-specific template.

    h. In the **Maximum UL PDUs** field, type 16.

    i. In the **Keep Alive Message Interval (Seconds 5-3600)** field, type 10.

    j. In the **Backhaul Message Timeout (Seconds 5-255)** field, type 10.

    k. In the **Max UL Margin (dB 0-31)** field, type 20

    l. In the **UL Overload Alarm Threshold (dB 0-31)** field, type 3.

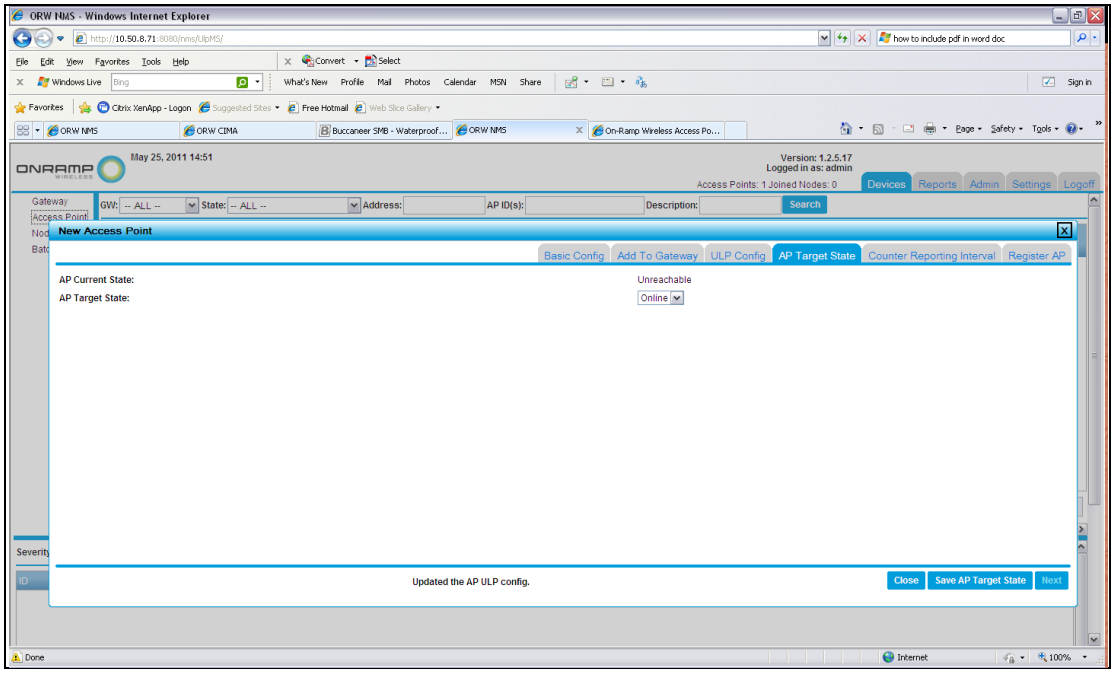
    m. In the **AP Interference Alarm Threshold (dB 0-31)** field, type 10.

19. Click **Save ULP Config**. In the pop-up window, type **Yes**.

    NOTE: A pop-up window allows the operator to enter a description of this event. This description will be entered into the system's audit report for future tracking of when changes were made to the system.

20. Click **Next**.

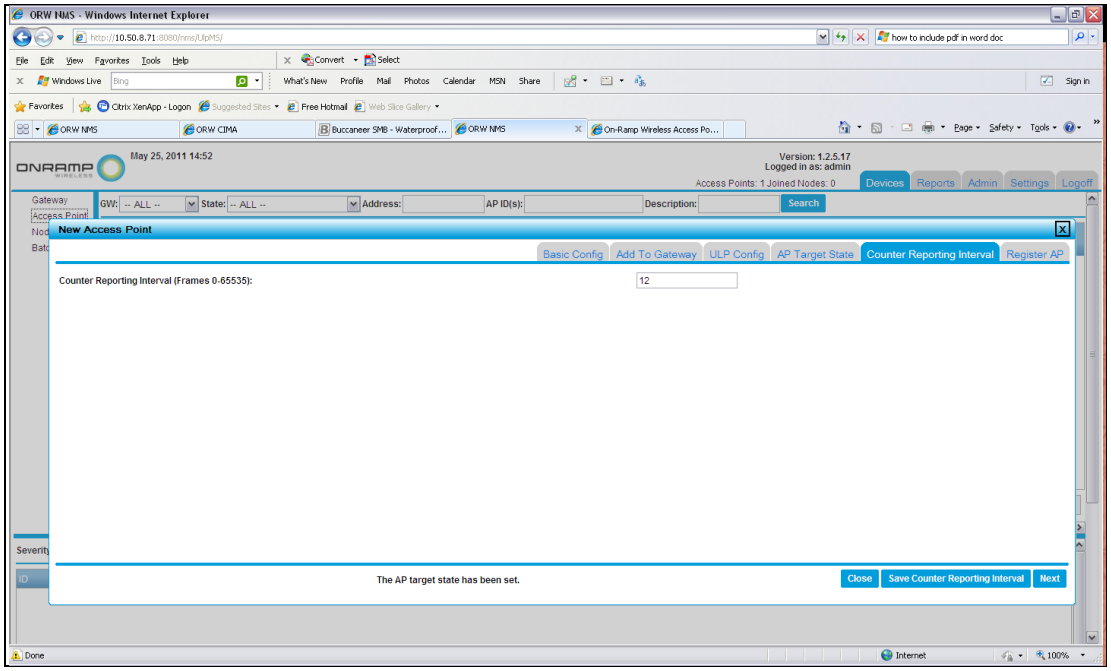
21. In the AP Target State window, select **Online** from the **AP Target State** drop-down list.



22. Click **Save AP Target State**. In the pop-up window, click **Yes**.

    NOTE: A pop-up window allows the operator to enter a description of this event. This description will be entered into the system's audit report for future tracking of when changes were made to the system.

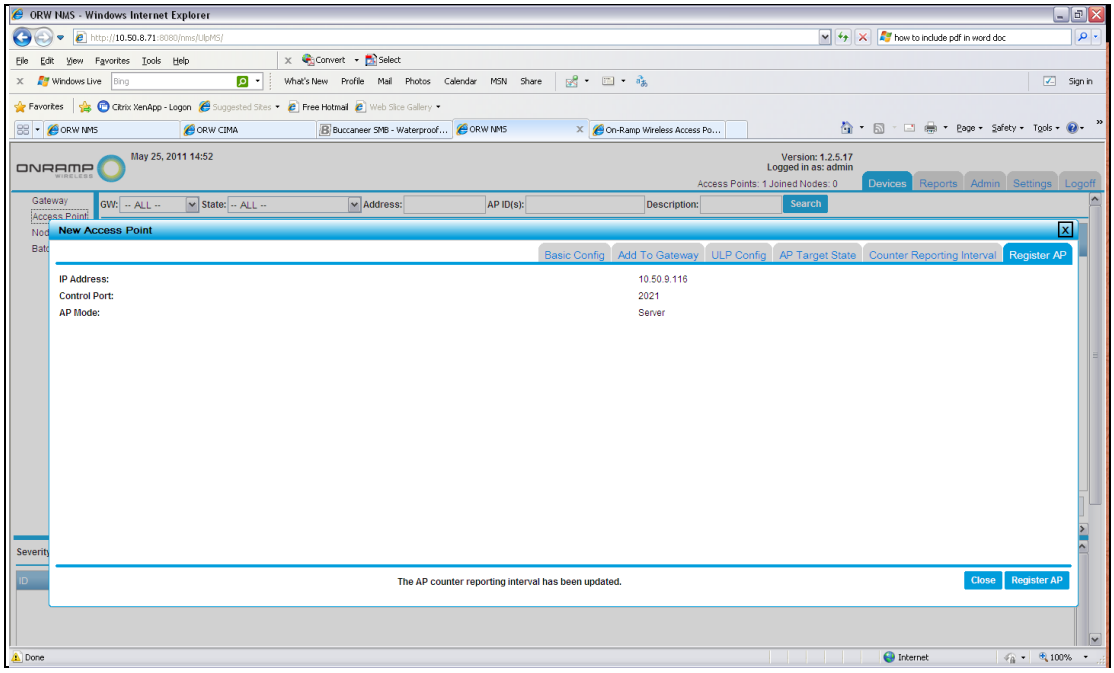
23. Click **Next**.



24. In the **Counter Reporting Interval (Numeric 0-65535)** field, type 12.
25. Click **Save Counter Reporting Interval**.
26. In the Update Notification pop-up window, click **Yes**.

NOTE: A pop-up window allows the operator to enter a description of this event. This description will be entered into the system's audit report for future tracking of when changes were made to the system.

27. Click **Next**.

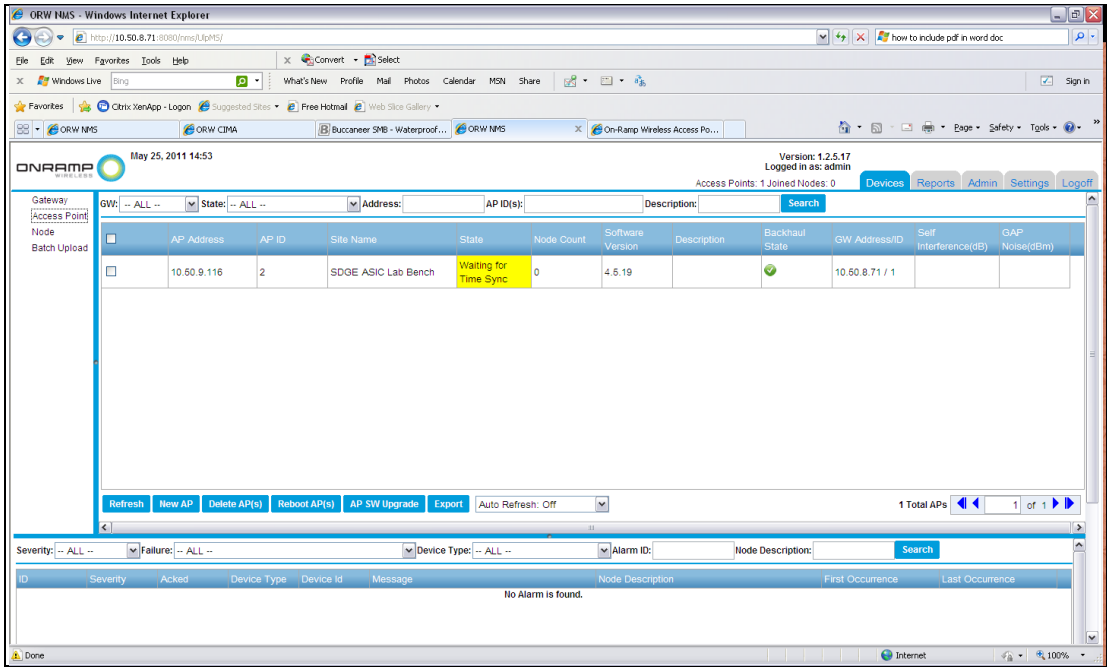


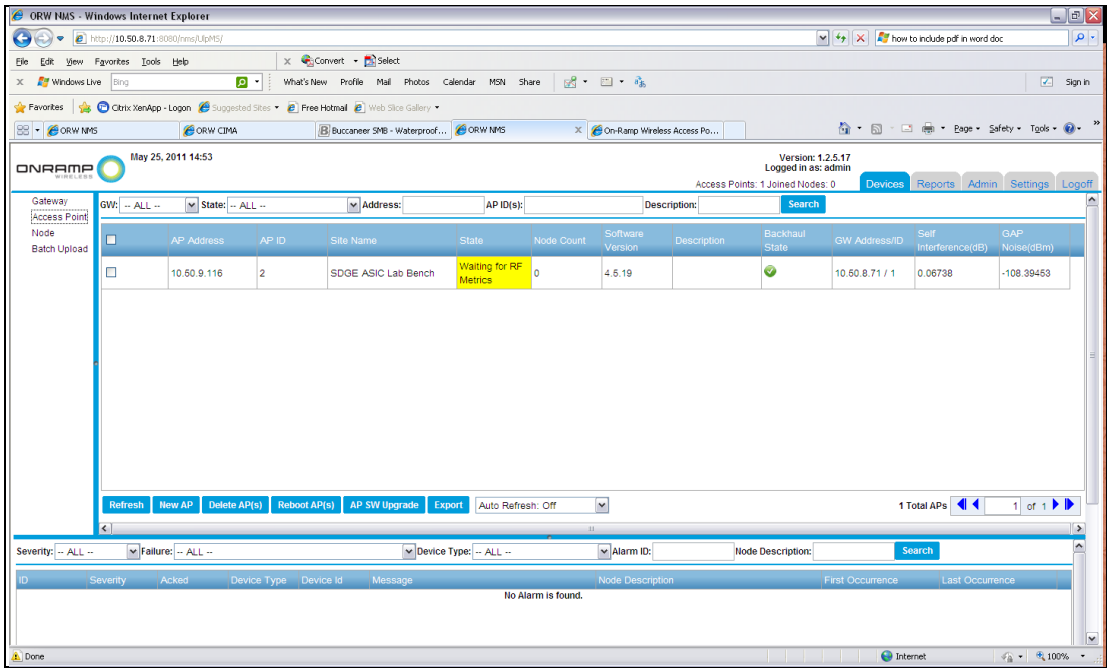
28. Click **Register AP**. A pop-up window asks the operator to confirm the addition.

NOTE: A pop-up window allows the operator to enter a description of this event. This description will be entered into the system's audit report for future tracking of when changes were made to the system.

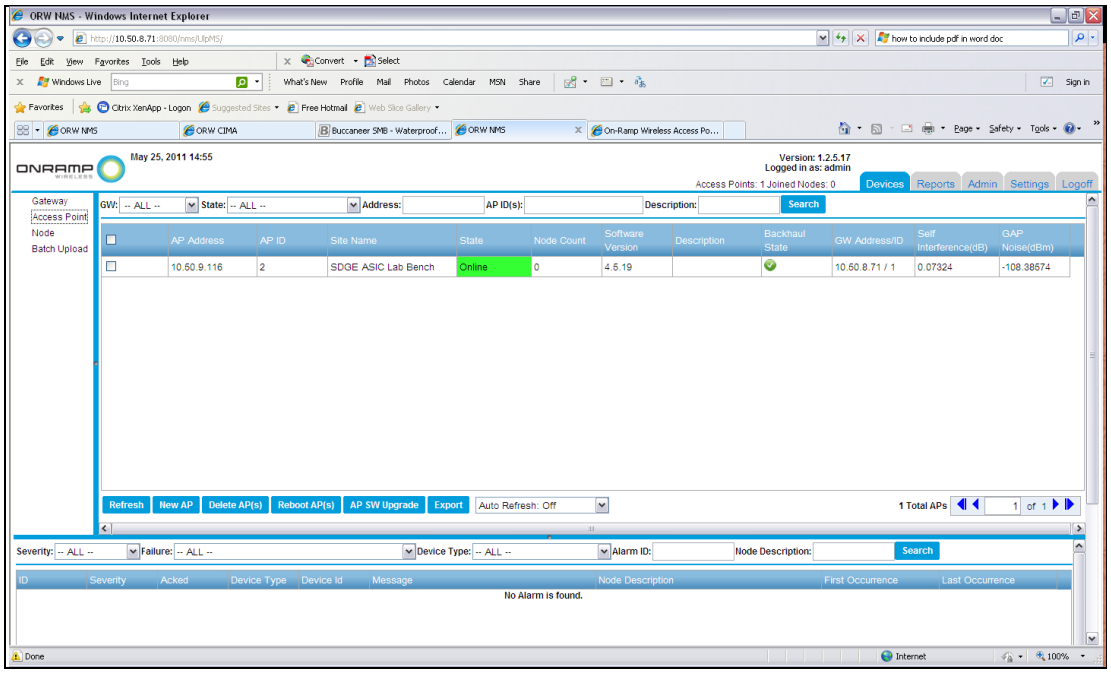
29. Click **Yes**.

NOTE: The EMS AP status does not update immediately. Eventually, the status shows that the AP has transitioned to a yellow state. Alternatively, the operator can click **Refresh** from the Access Point Device Listing screen. Depending on when the screen is refreshed, the operator will see **Waiting for Time Sync** or **Waiting for RF Metrics** display in the **State** field. This is normal behavior for an AP that is transitioning from an offline state to an online state. The AP goes through an initialization period in which it first finds the GPS and then measures the RF noise that the AP experiences. During this process, the AP adjusts the RF behavior accordingly. Typically, this adjustment takes approximately 2.5 minutes to complete.





After the AP adjusts the GPS time sync and RF Metrics, the AP transitions from a yellow state to a green state as shown below.



3.5.5 Configuring an End Device

End devices are application specific, and operators may need to configure devices in multiple ULP network elements. Operators must perform a network configuration to each device from the EMS. This is called control configuration. Operators must also configure an end device in CIMA and/or another application-level tool. This is called data configuration.

To perform a network configuration of a device in the EMS, add the device to the EMS to allow it to join the network, define the type of device (for example, enter the device's intended data application), and configure the update profile by configuring the Update Interval (UI) and the Listen Interval (LI).

Adding a remote device is a multi-step process that can last several days in a geographically diverse network. For example, there may be a work order requesting that several devices of a particular type, such as an FCI or an RMU, be installed in the upcoming week. The work order maps specific radio Node IDs (also known as MAC addresses) for each device to be installed to a device type and the physical location where the device will be installed. When filing the work order, provide information to the EMS operator. The EMS operator enters specific node information into the EMS for each device that will be installed. After the EMS is updated, the operator can install the device. The amount of time between adding a device to the EMS and the installation of the device in the field can last several days.

The following steps summarize this process:

1. Issue a work order to install devices.
2. Pull the devices from stock, and note the Node ID (MAC address), application (FCI or FAA), and planned installation location details (district, pole, circuit, etc.).
3. Enter device information from Step 2 (above) into the EMS.
4. Physical device installation is scheduled.

5. Physical device installation is completed. The devices will connect at this time, and they are visible in the EMS system.
6. Post installation delivers the completed work order that validates the Node ID (MAC address), application, and installation location to the CIMA operator for post installation application data configuration.

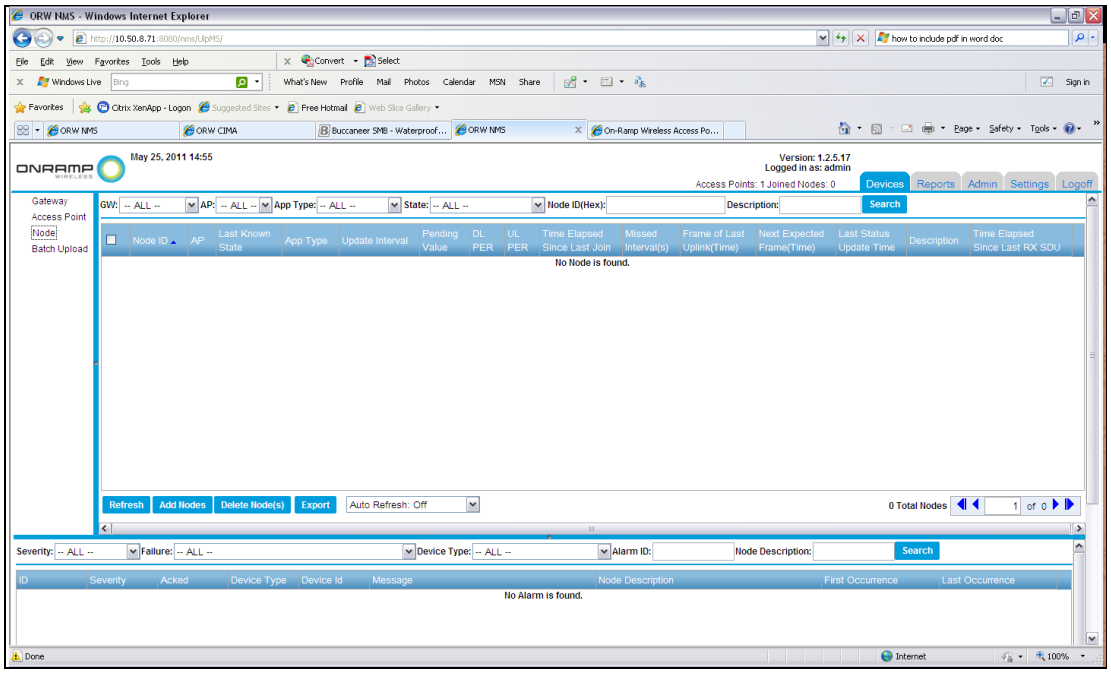
3.5.6 Adding an End Device

To add a device, complete the following steps:

1. The operator must have the work order that maps the radio Node ID (MAC address) to the device type and physical location.
2. Log in to the EMS with an admin or operator account.
3. Make sure a Gateway is established.
4. Make sure an AP is up and running.

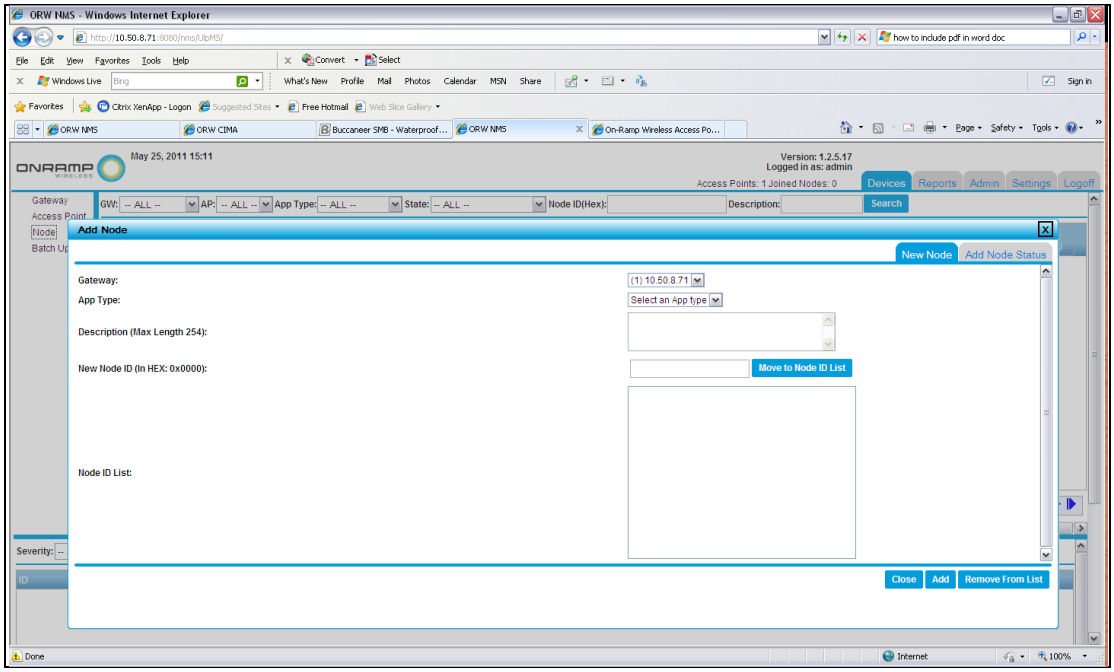
   NOTE: Make sure the AP is providing wireless coverage to the physical location of the device to install.

5. Click the **Devices** tab.
6. In the Devices pane, click **Node**.



NOTE: If this is the first time adding an end device, this page will be blank.

7. Click **Add Nodes**.



8. Complete the information for the following fields.
   a. In the **Gateway** field, select the Gateway.
   b. In the **App Type**, select the application type for this node from the drop-down list.
   c. Optional: Enter a description for the node.
   d. In the **Add Node ID (In HEX: 0x0000)** field, type the ID of the radio node.
9. Click **Move to Node ID List.** The node displays in the **Node ID List** field.
10. Click **Add**.
11. Click **Add**. A message displays stating that the Node is being added. After the node is added, it will report **Nodes are added**.
12. Repeat Steps 8.b through 9 for as many nodes as needed to add for this work order.

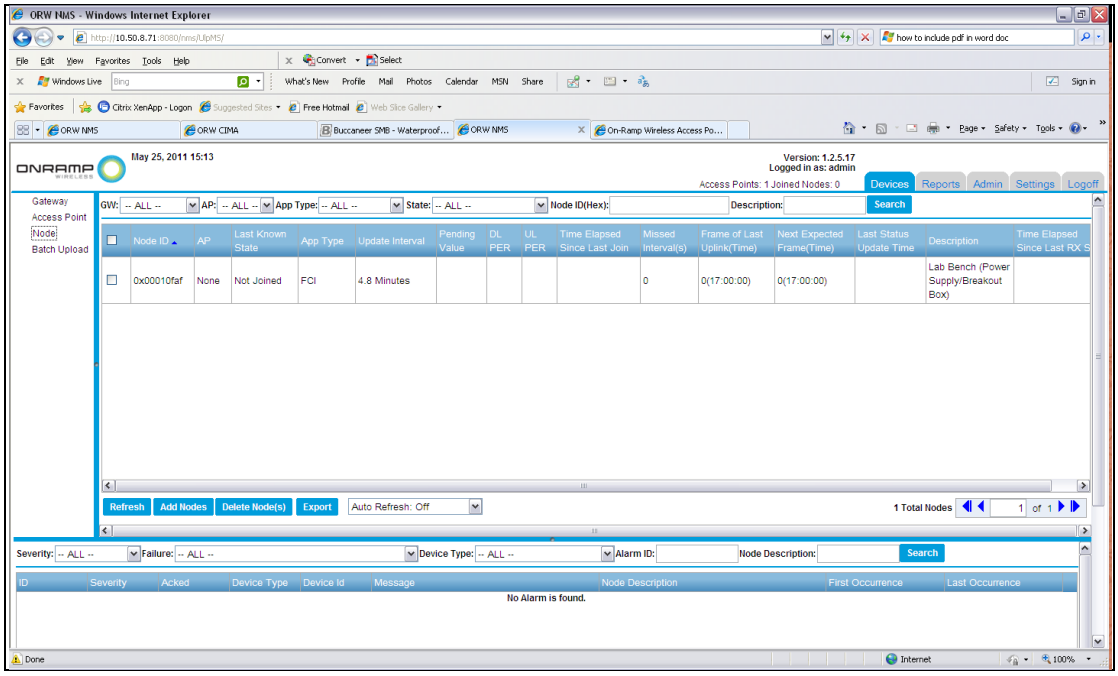
3.5.7 Configuring a Specific Device Update Interval (UI) or Listen Interval (LI)

It is ***critical*** that the operator set the device UI and/or LI correctly.

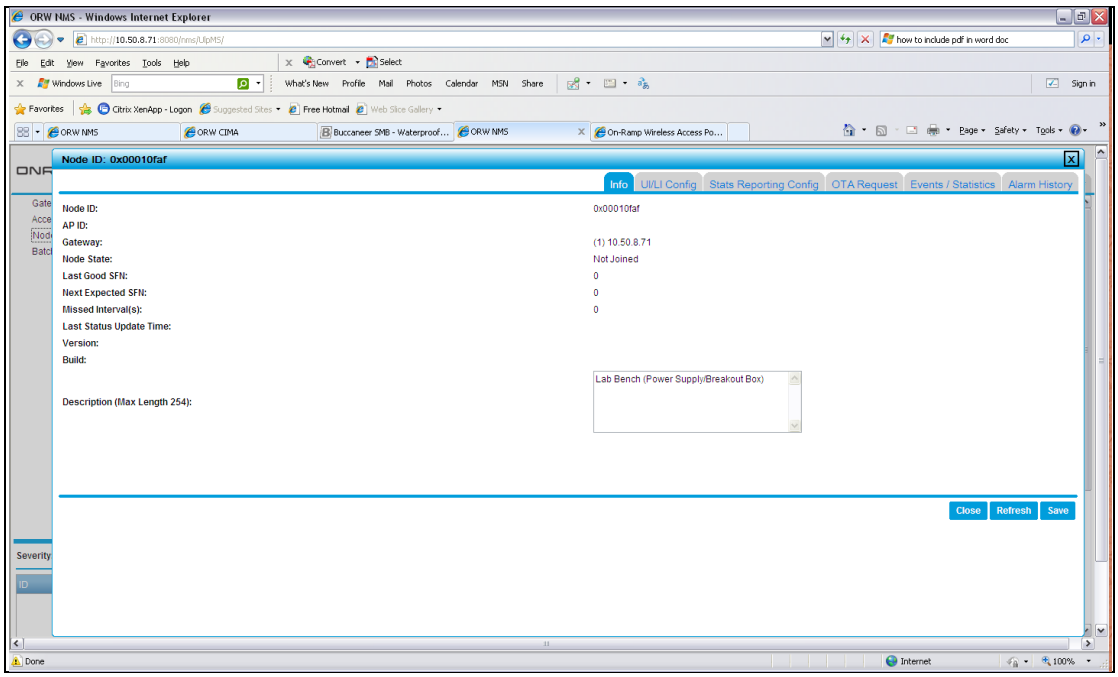
ATTENTION: The UI/LI for a given device controls how often a device wakes up to receive or transmit data. This configuration directly controls the energy that a given device uses. For battery-powered devices, these settings impact how long the battery for a battery powered device lasts. The tables below define the UI/LI for each type of device. The operator must follow the settings in this document unless directed otherwise by the appropriate On-Ramp Wireless personnel.

To configure a specific device Update Interval (UI) or Listen Interval (LI), complete the following steps:

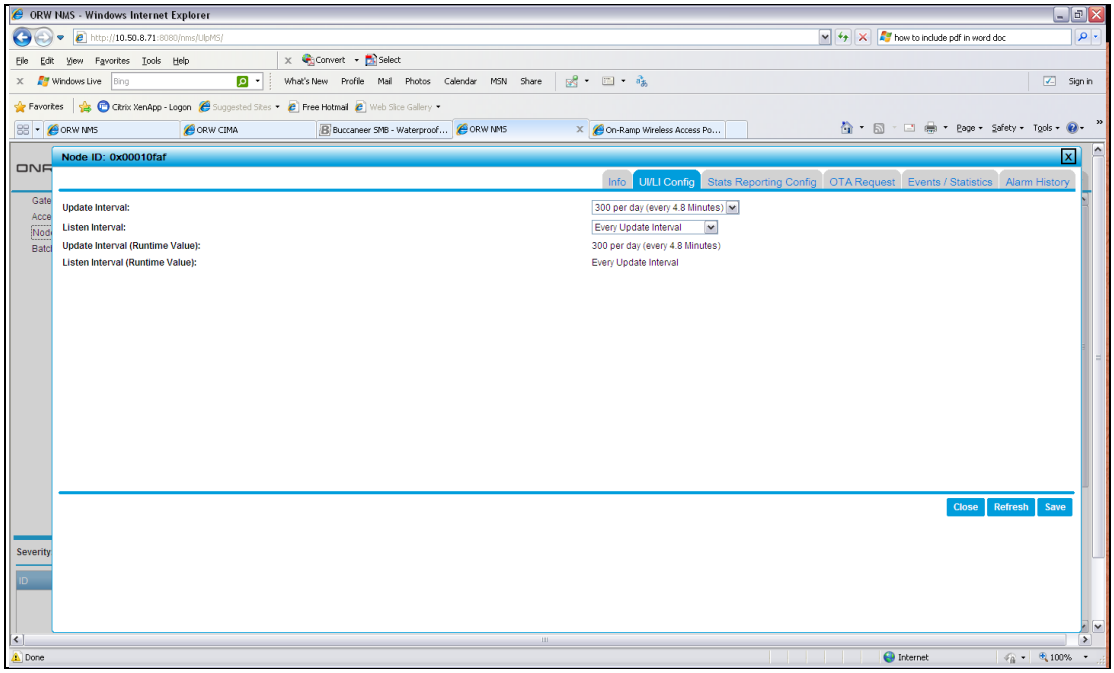
1. In the **Device Selection Pane**, click on **Node.** From the Node Device Listing Pane, select the **Node ID** of the node to configure. For example, in the following screen, there is one node in the list of nodes. This node has a Node ID of 0x10faf.



2. Click the Node.



3. Click the **UI/LI Config** tab.



This release of the ULP EMS Operator Guide includes the following supported types of end devices (nodes):

- **Sysmon:** System monitor node that provides network-specific information to the EMS operator. This helps the EMS operator to understand the health of the ULP network.

  Configure the UI and LI with the values from the following table.

Table 1. Sysmon UI and LI Values

Interval (UI and LI)	Value
UI	every frame
LI	Every update interval

- **Fault Circuit Indicator (FCI):** Battery powered distribution line device that reports current and/or voltage faults in a distribution line.

  Configure the UI and LI with the values from the following table.

Table 2. FCI UI and LI Values

Interval (UI and LI)	Value
UI	1 per day (24 Hours)
LI	Every update interval

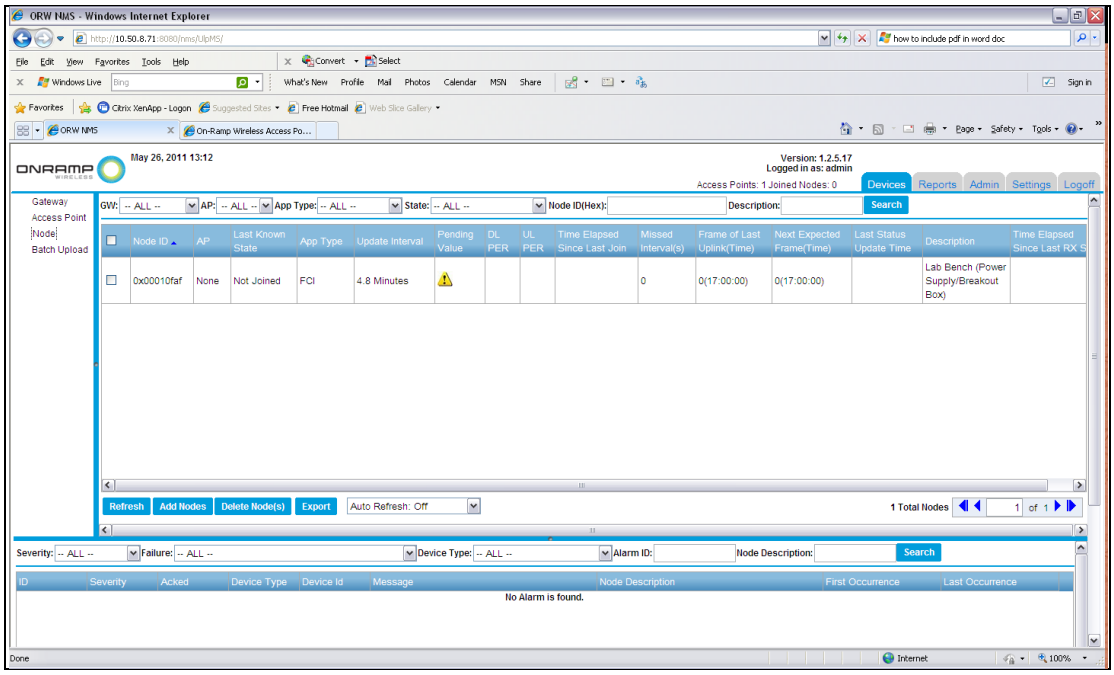
- **Remote Monitoring Unit (RMU):** Monitors the obstruction lights and reports the outages of the obstruction lights. These outages must be reported to the FAA.

  Configure the UI and LI with the values from the following table.

Table 3. RMU UI and LI Values

Interval (UI and LI)	Value
UI	60 per day (24 minutes)
LI	Every update interval

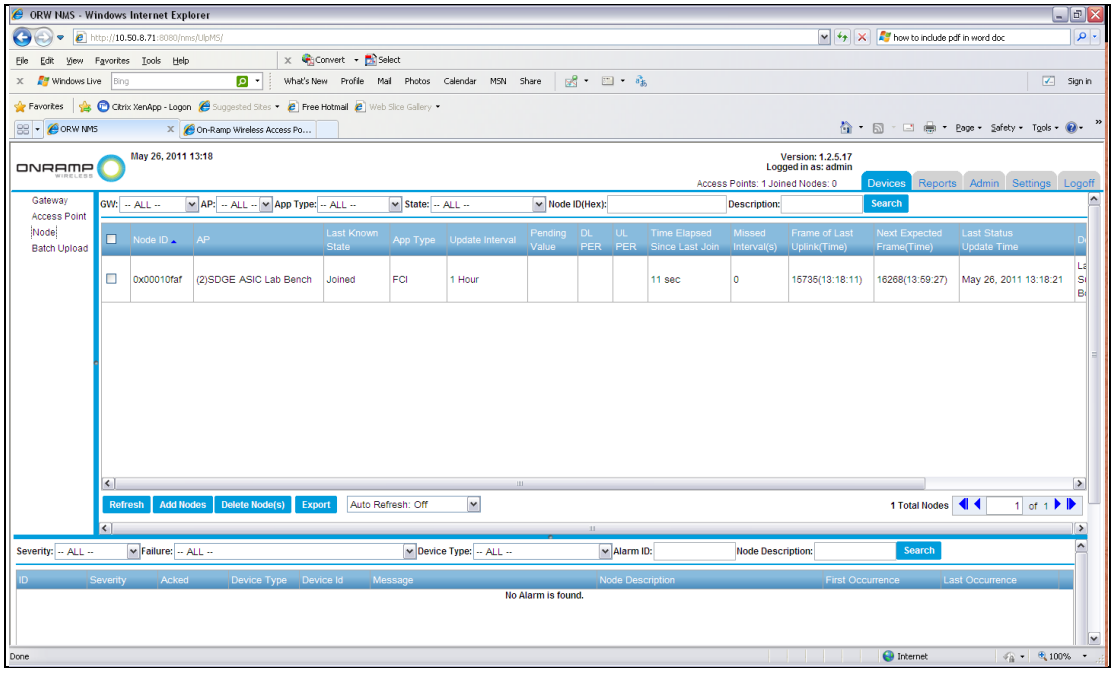
4. After entering the UI and LI for a device, click **Save**, and click **Yes**. The device that was just added displays on the list as **Not Joined** with an asterisk in the **Pending Value** field. This denotes that the device has been configured in the EMS, but it has not yet joined the network. The device will stay in this state until it is physically deployed, powered on, and joins the network.



NOTE: Sysmon nodes show a critical alarm after they have been added to the EMS, prior to being powered on. Ignore this alarm. After the Sysmon nodes are powered on, this alarm will be automatically cleared.

5. Optional: To confirm that the correct UI/LI for the device was set, select the device from the list of devices, and click the **UI/LI Config** tab. Verify the configuration information.

   After verifying the configuration information, the node has been added to the EMS. The work order proceeds with the physical installation of the device. After the devices are powered on in the field, the EMS operator can confirm (in the EMS) that these devices have joined the network. The operator can easily identify which device has joined the network, as the Pending Value asterisk is not displayed.



3.6 Day to Day Operations

An EMS operator performs several tasks during the initial deployment of the network and adding end devices to the ULP network. For day to day operations of the ULP network, the EMS operator does not need to use the EMS console directly.

In a typical ULP network deployment, the system can operate for months without ever generating an EMS alarm event. For day to day operations, the EMS supports email alerts to automatically notify operators of EMS alarms.

When the EMS generates an alarm email, the EMS operator uses the EMS console to acknowledge the alarm and debug the reason for a given ULP alarm. Typically, the operator might use a combination of console monitoring and email alerts to operate the system daily.

If the EMS operator uses the EMS console daily to maintain the ULP network, it is recommended that they set up and use the email notification alarm system to help identify issues with the ULP network. In general, the EMS console displays system-wide alarms without requiring additional configuration.

The EMS contains alarm functionality to help diagnose issues at all levels of the network. The EMS will generate alarms for issues with:

- Gateways
- Access Points
- End Devices (Nodes)

3.6.1 Summary of Alarms

This section summarizes EMS generated alarms. The following table contains a short summary for each alarm, including:

1. Network element affected by the alarm
2. Severity of the alarm
3. Short description of the alarm
4. Alarm clearing condition

The sub-sections, after the table, provide details for each alarm, such as descriptions for each alarm and how to proceed when receiving each type of alarm.

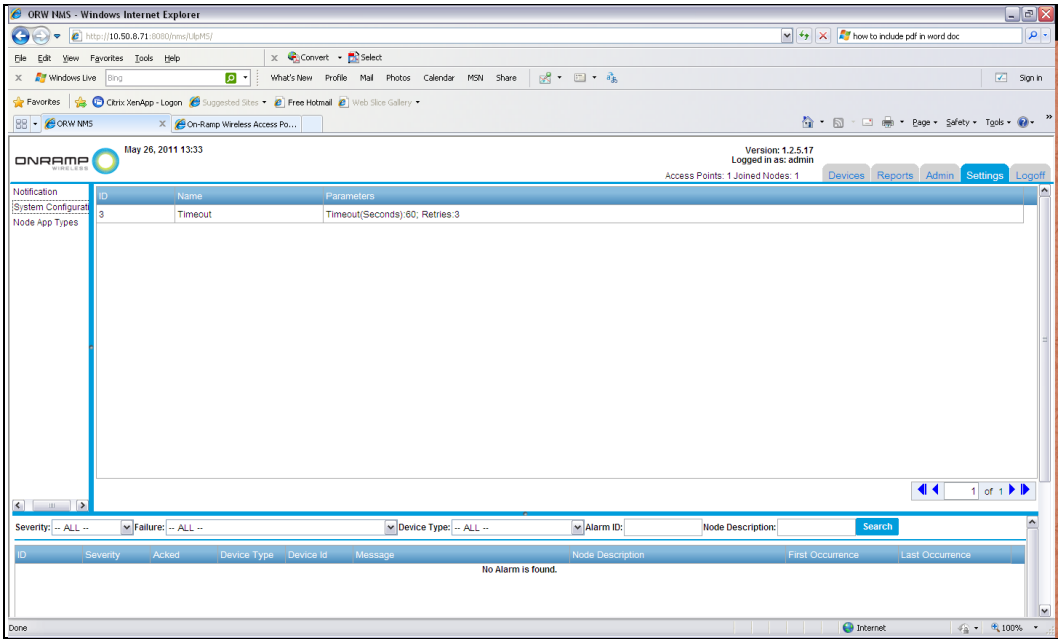
Table 4. Alarm Type and Severity, Description, and Clearing Condition

ULP Network Element	Severity	Description	Clearing Condition
GW Process Health	Critical	An GW to EMS connectivity timeout.	Re-establishing GW to EMS backhaul port connectivity.
AP Process Health	Critical	An AP or AP/GW backhaul error.	Re-establish the AP process and/or AP/GW Backhaul Connectivity.
AP Not Online	Critical	An AP is offline	AP goes back online
PPM Drift	Critical	An AP crystal drifted out of tolerance.	Automatically cleared when the AP crystal is back in tolerance.
Overload Adjustment	Critical	The AP has determined that the node capacity is overloaded.	Automatically cleared when the AP over load condition has been cleared.
Software Asserts	Info	A ULP Gateway, an AP, or a Node has generated a software assert.	Automatically cleared by the software.
Node Frequent Rejoin	Major	An end device has rejoined the network > 10 times in a 250 second window.	Automatically cleared when a node does not rejoin > 10 times in a 250 second window.
Node Missed Intervals	Minor, Major, Critical	A Node has missed update intervals.	Automatically cleared when a node stops missing update intervals.
Sysmon Node Communications	Critical	A Sysmon end device has not communicated to an AP in its expected interval.	Automatically cleared when the Sysmon rejoins the AP and starts communicating.
Frame Squishing	Critical		
EMS DB Backlog	Major	The EMS database is falling behind.	Automatically cleared when the database catches up.
Interference	Critical		Automatically cleared when the interference clears up.

Node Join Failure	Major	An alarm generated when an end device is not allowed to join the network by the GW.	Automatically cleared when the underlying cause is fixed and the device is allowed to join the network. This is cleared if the device is deleted from the EMS, because it was not supposed to be allowed onto the network.
TX Suppression	Critical		Automatically cleared.
AP Proximity Fault	Warning	An AP lid has been opened.	Cleared when the AP lid is closed.
AP GPS Fault	Warning	An AP has lost its GPS fix.	Cleared when the AP can get a GPS fix.
AP VC-TCXO High Temperature	Warning	The AP operating temperature is too high.	Cleared automatically when the AP temperature is brought down.
AP PA High Temperature	Warning	The AP operating temperature is too high.	Cleared automatically when the AP temperature is brought down.
AP Max VGA Exceeded	Warning		Automatically cleared.
AP Min VGA Exceeded	Warning		Automatically cleared.
AP Fragmented Channel Threshold Exceeded	Warning		Automatically cleared.
Message Processing Delay	Major	The EMS database is taking too long to insert raw messages into rows.	EMS database processing returns to normal operation.

The following items are various EMS configurations that affect alarm operation:

1. The Keep Alive configuration of the GW controls the GW Health Alarm. To confirm the timeout settings for the alarm, navigate to the screen shown below.



2. A system administrator can control additional default parameters for the following alarms through editing the /opt/onramp_apps/nms_config.properties file on the EMS server. If editing the nms_config.properties file after starting the EMS, restart the EMS backhaul to show the changes. Some alarms can be permanently disabled by setting parameters in the nms_config.properties file. For detailed information about permanently disabling alarms, call On-Ramp Wireless.

   a. The following alarms have configuration parameters in the nms_config.properties file:

      - GW Health Alarm Timeout
      - Node Missed Intervals
      - Node Frequent Rejoins
      - Sysmon Node Communications

   b. To restart the EMS backhaul, the system administrator should log in to the EMS server through a terminal and run:

      - `/sbin/service onramp_EMS_backhaul stop`
      - `/sbin/service onramp_EMS_backhaul start`

3.6.1.1 GW Process Health

This type of alarm indicates that the EMS and Gateway (GW) cannot maintain communication through the network backhaul. The following conditions can cause a connectivity alarm:

1. The GW server and/or software process has died. To verify that the GW server and software are running, complete these steps:

   a. Log on to the physical GW server using a UNIX®/Linux® terminal shell. If the operator cannot log in to the GW, they may need to verify the physical status of the GW.

   b. Run the following command from the shell prompt:
   `/sbin/service ulp-gateway status`

   The output from this indicates if the GW is running.

   c. Restart the GW with the following commands from the shell prompt:
   `/sbin/service ulp-gateway stop`

   `/sbin/service ulp-gateway start`

2. The network connectivity between the EMS and the GW is broken. An operator should use the standard networking debugging tools to verify the availability of the backhaul connectivity between the EMS and the GW. For example, the operator can ping the GW to validate that it is available through the backhaul network. When re-establishing the backhaul connectivity, the operator may need to contact the backhaul provider to help diagnose the issue.

3.6.1.2 AP Process Health

This type of alarm indicates that the AP and GW cannot communicate. This is due to the following reasons:

1. The AP died. To diagnose the AP, complete these steps:
   a. Log in to the AP web page:

      https://<AP IP address>

   b. From the AP web page, note the status of the AP.
   c. From the EMS and/or AP web page, reboot Access Point.
2. The network connectivity between the AP and GW is broken. An operator should use standard networking debugging tools to verify the availability of the backhaul connectivity between the AP and GW. For example, the operator can ping the AP to validate that it is available through the backhaul network. When re-establishing the backhaul connectivity, the operator may need to contact the backhaul provider to help diagnose the issue.

3.6.1.3 AP Not Online

This type of alarm indicates that the AP is in an offline state due to an unplanned event.

NOTE: This is ***not*** due to a backhaul outage, and the operator should not have to diagnose the network connectivity.

This alarm can be investigated in the following ways:

1. From the EMS:
   a. In the Devices->Access Point pane of any EMS screen, select the alarming AP. Explore the state of the AP through the detailed AP listings.
   b. After diagnosing the AP, the operator may need to reboot the AP from the EMS AP detailed pages console.
2. From the AP web page:

   NOTE: In some cases, the EMS may not provide sufficient ways in which to diagnose the problem.

   a. Log in to the AP web page:

      https://<AP IP address>

   b. From the AP web page, determine the status of the AP.

      The operator may need to reboot Access Point from the AP web page.

3.6.1.4 PPM Drift

NOTE: The PPM drift alarm is a ***serious alarm*** that is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm has been detected, or if this alarm has been cleared, call On-Ramp Wireless.

The operator can attempt to clear the alarm by rebooting the AP generating this alarm. If this clears the alarm, call On-Ramp Wireless.

If rebooting the AP does not clear the alarm, move the AP to an offline state in the EMS, and call On-Ramp Wireless.

3.6.1.5 Overload Adjustment

The overload adjustment alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless. On-Ramp Wireless may schedule a service call to perform an AP forced rescan to fix this issue.

3.6.1.6 Software Asserts

The On-Ramp Wireless AP, GW, and Node software automatically detects various error conditions. When an error is detected, the software may generate an assert alarm.

The assert alarm generates a log message with a reason code, including a line of code and the file responsible for the alarm. If there is an AP, GW, or Node assert alarm, it is typically expected that the assert will result in an automatic restart of the GW, AP, or Node that generated the assert condition.

In the event of an assert alarm, the following situations may exist:

1. The underlying cause of the software alert is due to an unforeseen system issue, such as an assert that is being generated repeatedly. This indicates that there is a system failure, and the operator ***must*** call On-Ramp Wireless.
2. The underlying cause of the software alert is due to an unforeseen event that happens very infrequently. This assert is not likely to be seen again, and the system is again operating as expected. Notify On-Ramp Wireless of this assert alarm.

3.6.1.7 Node Frequent Rejoin

If an end device is frequently rejoining, it can indicate an error in many different aspects of the system.

The operator should schedule a service call. The appropriate On-Ramp Wireless personnel may come on site to get additional information from the EMS system. The On-Ramp Wireless personnel may also direct an EMS operator to enable additional debugging aspects of the device through the EMS console.

To clear the problem, try to reboot the GW and/or AP. This may not resolve the problem.

3.6.1.8 Node Missed Intervals

This alarm indicates that an end device missed a configurable number of scheduled update intervals.

The system uses the following defaults for missed intervals:

- Three missed intervals trigger a minor alarm.

- Four missed intervals trigger a major alarm.
- Five missed intervals trigger a critical alarm.

NOTE: To guarantee that EMS operators receive RMU network alarms before CIMA operator alarms, modify the alarms to be 1, 2, and 3 instead of 3, 4, and 5. Using these settings will enforce that EMS operators must clear network issues before they propagate to CIMA operators. This configuration guarantees that the NMS operators will be the first responders to system events and have time to debug/clear up any ULP issues prior to the alarm elevating to the application operator level.

The RMU obstruction light update interval is 24 minutes. With settings of 1, 2, and 3 as discussed above, these alarms would correspond to a RMU that is missing 24, 48, or 72 minutes of updates respectively.

The update interval for FCIs is one per day. With settings of 1, 2, and 3, these alarms would correspond to an FCI that is missing 1, 2, or 3 days of daily updates.

If an end device reports missed update interval alarms, it may be a network or device specific issue.

While debugging this issue, contact the CIMA operator and inform them that there are end devices alarming on the network side. If an end device is missing EMS update intervals, it may be flagged in the CIMA system if the application CIMA missed interval alarm is configured as having the EMS and CIMA alarm intervals overlap.

If the EMS alarm is based on a single end device, and the CIMA operator confirms a CIMA alarm, the CIMA operator should confirm missed update intervals and provide other information that can explain the outage. For example, the FCI reporting this error may need a battery replacement, or the RMU reporting this event may have an issue with its battery charging system. If the problem cannot easily be described as a known issue with an FCI or RMU, the problem may be network related. The operator should schedule a service call. The appropriate On-Ramp Wireless personnel may come on site to get additional information from the EMS system. The On-Ramp Wireless personnel may also direct an EMS operator to enable additional debugging aspects of the device through the EMS console.

To clear the problem, reboot the GW and/or AP. This may or may not solve the immediate issue.

3.6.1.9 Sysmon Node Communications

The Sysmon is a dedicated end device that monitors an AP in the ULP network. Typically, there is one Sysmon per AP.

If a Sysmon alarm occurs, it is most likely due to a ULP network issue. The operator should schedule a service call. The appropriate On-Ramp Wireless personnel may come on site to get additional information from the EMS system. The On-Ramp Wireless personnel may also direct an EMS operator to enable additional debugging aspects of the device through the EMS console.

To clear the problem, reboot the GW and/or AP. This may not solve the issue.

3.6.1.10 Frame Squishing

The frame squishing alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless.

3.6.1.11 EMS DB Backlog

This alarm is set when the time difference between the EMS last queued raw message and the last inserted messages grow larger than some configured value (default 5 minutes). This alarm typically will require DBA related actions, such as purging or partitioning database tables.

If the DBA cannot clear the alarm, schedule an On-Ramp Wireless service call.

3.6.1.12 Interference

The interference alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless.

3.6.1.13 Node Join Failure

This alarm would typically be generated if an end device was trying to join the network, but it was not previously provisioned and added to the EMS. To fix the problem, add the node through the EMS, and configure the UI according to the procedures in this document.

If the device has been added to the network, there may be a security key mismatch. See the KMS documentation, and make sure that security keys have been imported. Additionally, the operator may need to debug the KMS, EMS, and GW IP connectivity to make sure there are no issues with the TCP/IP connectivity between these elements.

If the problem persists, call On-Ramp Wireless.

3.6.1.14 TX Suppression

The TX Suppression alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless.

3.6.1.15 AP Proximity Fault

This alarm is generated by an AP lid being opened. The opening of the AP's lid may be planned or unplanned. In a planned opening of the AP’s lid, the alarm will be cleared when the service call is completed. If the operator receives an AP open lid alarm for an unplanned AP service call, an unauthorized person may be opening the AP’s lid. Appropriate action, per internal policies, should be taken.

3.6.1.16 AP GPS Fault

This alarm is the result of an AP that loses its ability to get a valid GPS tracking signal. This is most likely due to a physical problem with either the AP and/or GPS antenna connected to the AP. This type of alarm would likely be in conjunction with other alarms (for example AP offline)

as an AP cannot operate without a GPS fix. The operator may need to roll a service truck to establish whether there is any issue with the antenna connectivity of the GPS antenna to the AP.

3.6.1.17 AP VC-TCXO High Temperature

This alarm is the result of the AP operating in a temperature extreme that is above its intended design target. The operator should investigate the AP's physical location, and validate that it is operating within its installed operating parameters. If the physical operating environment for the AP is within its operating parameters, the operator should call On-Ramp Wireless.

3.6.1.18 AP PA High Temperature

This alarm is the result of the AP operating in a temperature extreme that is above its intended design target. The operator should investigate the AP's physical location, and validate that it is operating within its installed operating parameters. If the physical operating environment for the AP is within its operating parameters, the operator should call On-Ramp Wireless.

3.6.1.19 AP Max VGA Exceeded

This alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless.

3.6.1.20 AP Min VGA Exceeded

This alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless.

3.6.1.21 AP Fragmented Channel Threshold Exceeded

This alarm is not likely to be cleared without a service call to On-Ramp Wireless. If this alarm is detected, call On-Ramp Wireless.

3.6.1.22 Message Processing Delay

If this alarm occurs, the time difference between the last queued database raw message and the last inserted database message has grown longer than the default (default is 5 minutes). This means that database actions are falling behind and may require a DBA to take database action. For example, the DBA may need to perform database related actions, such as purging or partitioning. Call On-Ramp Wireless for help in analyzing this type of alarm.

3.6.2 Configuring Alarm Emails

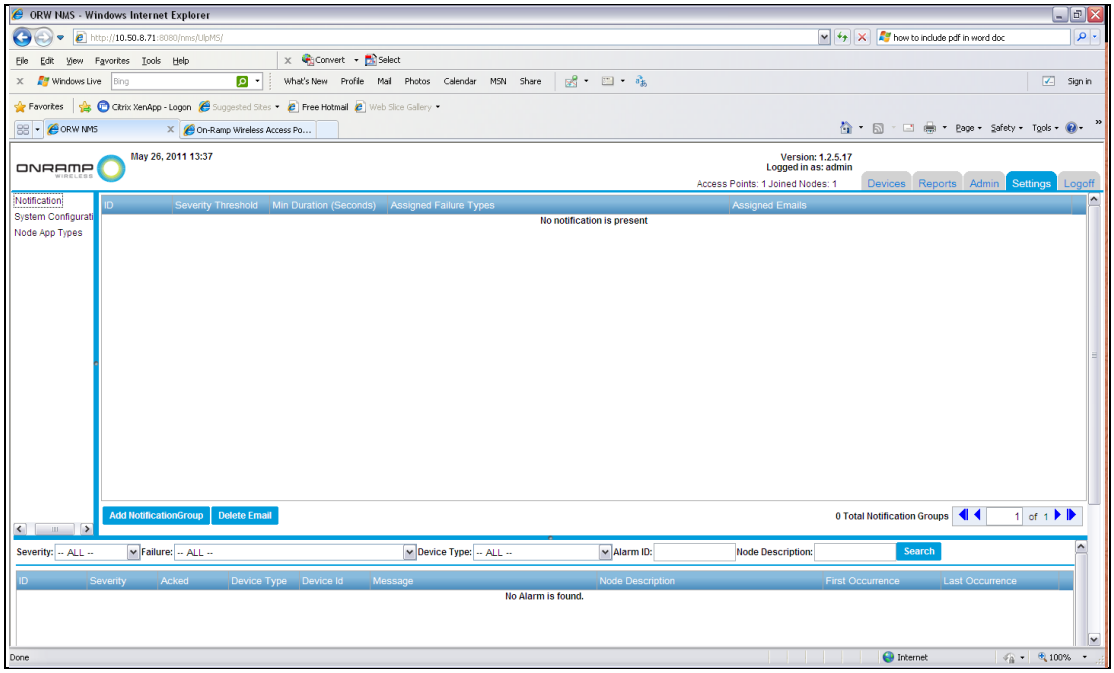
Configure the EMS alarm notification system before using it.

To configure the EMS notification alarm system, log in as a user with admin privileges.

NOTE: The EMS email configuration in the /opt/onramp_apps/nms_config.properties file must be configured according to the directions in the EMS Installation Guide.

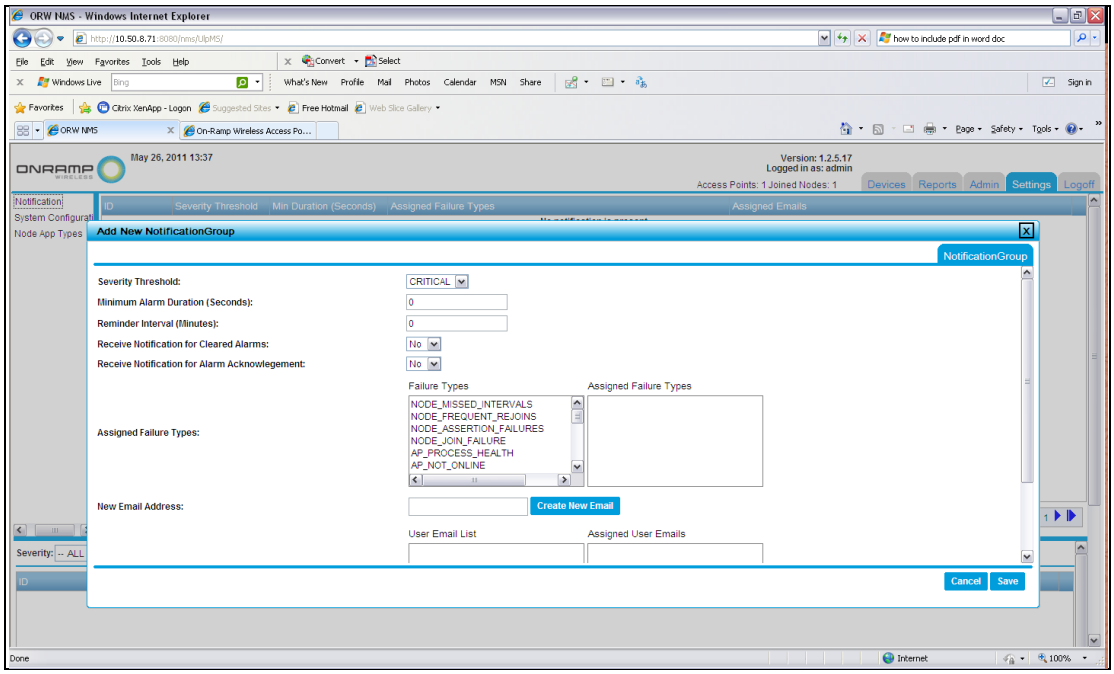
To configure email based alarms, complete the following steps:

1. Log in to the EMS console, and click the **Settings** tab. If this is the first time creating email based alarms, the screen will be blank as shown in the following figure.



2. In the left pane, click **Notification**.

3. Click **Add Notification Group.**



4. In the new **Add New Notification Group** window, complete the information for the following fields.

   a. In the **Severity Threshold** field, select the alarm severity for this email notification group from the drop-down list.

      NOTE: Depending on the threshold for a chosen alarm severity, an email is generated for alarms at that level or above that level in importance. For example, when choosing Major Alarms, an email for Major or Critical is generated. The following importance levels for alarms range in order from highest importance to least importance:

      - Critical
      - Major
      - Minor
      - Warning
      - Info

   b. In the **Minimum Alarm Duration (Seconds)** field, type the duration of time in which an email alert will be triggered. For example, if this parameter is set to 10 seconds, and the operator receives an alarm that is self-cleared in less than 10 seconds, the email alert will not be generated. If the operator wants an email for every alarm regardless of the interval, the operator should set this parameter to 0.

   c. In the **Reminder Interval (Minutes)** field, type the number of minutes between alarm reminder emails. This parameter generates a reminder alert email until the alarm is acknowledged. If the operator does not want to receive reminder emails, the operator should set this parameter to 0.

      NOTE: Be careful with the value set in this field. If setting a short reminder threshold, several system emails for unacknowledged alarms can be generated. For example, if setting a 1 minute threshold and it takes an operator an hour to acknowledge an alarm, 60 reminder emails based on the 1 minute setting can be generated. Typically, the operator can set 1-2 hours for the reminder email.

   d. In the **Receive E-mail for Cleared Alarms** field, select **Yes** or **No** from the drop-down list.

   e. In the **Receive E-mail for Acknowledgment** field, select **Yes** or **No** from the drop-down list.

   f. In the **Assigned Failure Types** fields, drag the alarms to configure for this notification group from **Failure Types** to **Assigned Failure Types**.

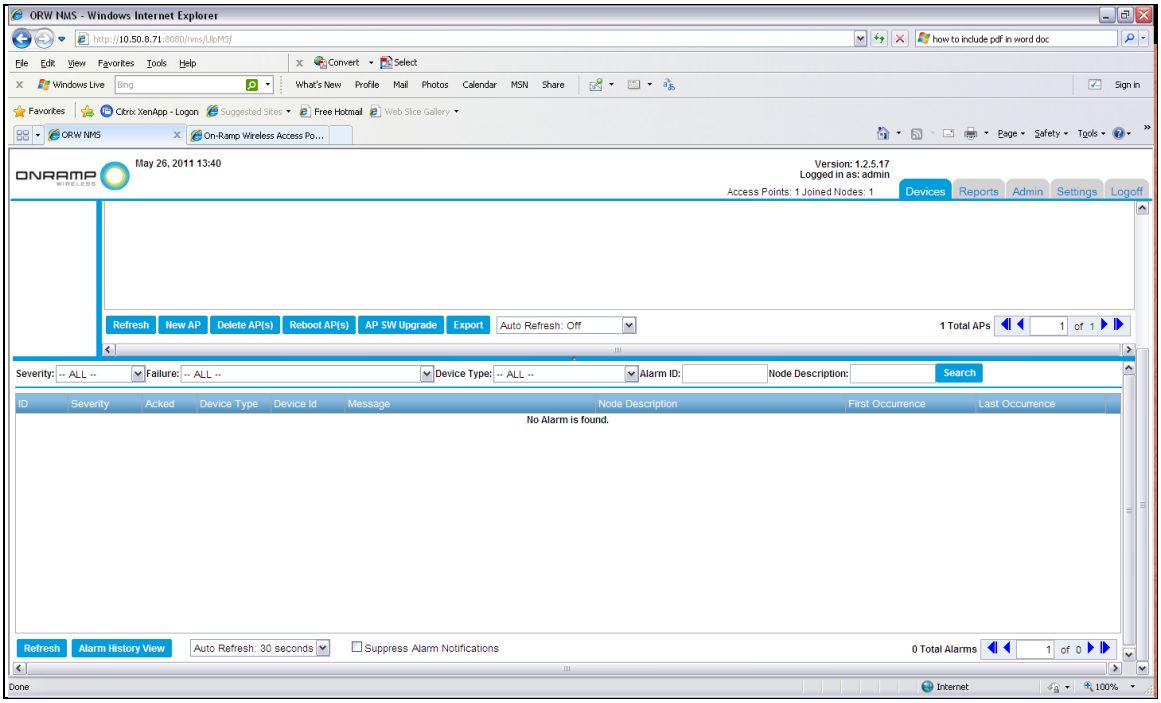
NOTE: Several email alert notification groups can be created as necessary for work flow. In this field, the operator can segment alarm types and create email groups that are alerted for issues that are of concern. For example, node side alarms should automatically facilitate the EMS operator to contact the CIMA operator to clarify the operation of the end device. In this case, it may be beneficial to create an alarm notification group that selects the node alarm failure types to be sent to a CIMA email group. The CIMA operators will automatically receive an email alert from the EMS alarm system when there is a node alarm that they should pay attention to.

g. In the **New E-Mail Address** field, type the email addresses for the notification group. If this is the first time creating notification groups, type the email addresses in this field. When adding emails in this field, click **Create New E-mail**. This adds the email addresses to the **User E-mail List**.

h. In the **Assigned User E-mails** field, drag the user's email address from the **User E-mail List** to **Assigned User E-mails** to create the email list for this notification group.

i. Click **Save**.

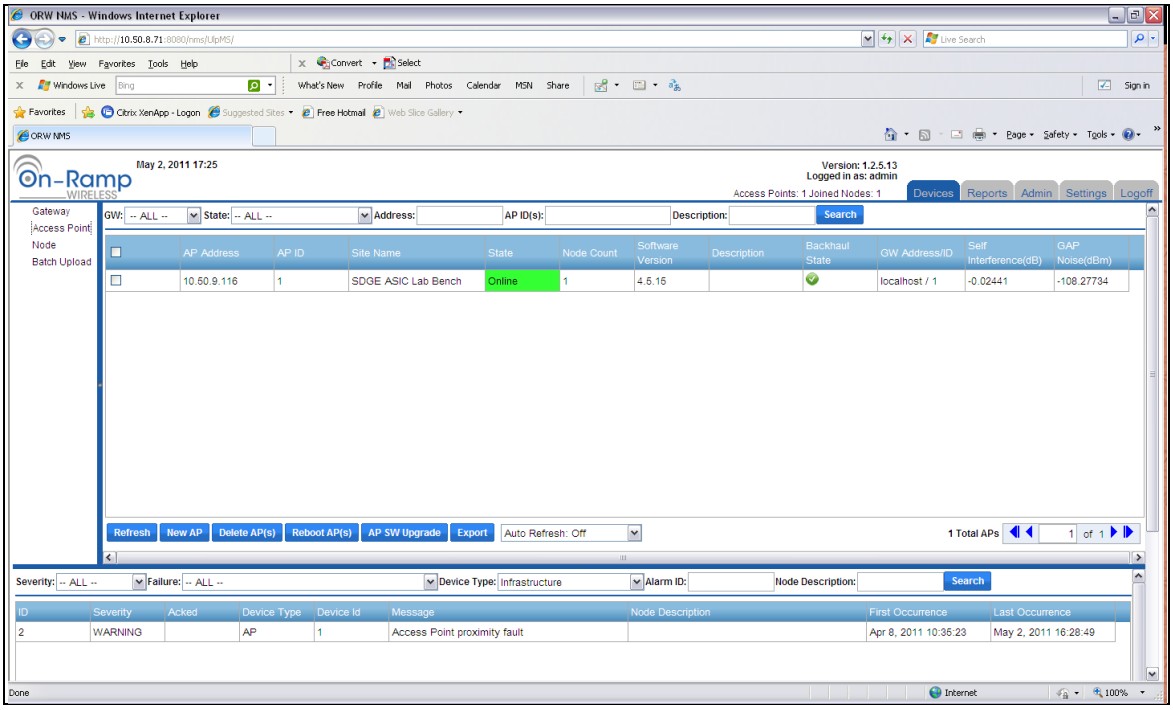
Appendix A contains an example of an email alert message. When configuring and using the email alarm notification system, the operator can disable the email alarms. To disable email alarms, the operator must log in to the EMS console, and select the **Suppress Alarm Notification E-mails** box in the Alarms Summary pane. The Alarms Summary pane is shown below.



3.6.3 Details of the Alarm Console

EMS alarms are visible in the EMS operator's console display. On the EMS login screen, the lower pane displays the active alarms in the EMS.

In the following example, there is a single warning in the system.



The single warning is an AP proximity alarm meaning that the lid of AP ID #1 has been opened. If the email alarm system is in use, this alarm contains an email alert message. For more information, see Appendix A.

As shown in this example screenshot, the alarm pane of the EMS display includes several drop-down lists and search fields to help sort and quickly find alarms if there are many alarms to sort through.

- The **Severity** drop-down list allows operators to clear the alarm pane of all alarms except for alarms of a selected severity.
- The **Failure** drop-down list allows operators to clear the alarm pane of all alarms except for alarms of a given failure type.
- The **Device Type** drop-down list allows operators to clear the alarm pane of all alarms except for alarms of a given device.
- The **Alarm ID** search field allows operators to search for an Alarm ID from an email. Each alarm email includes an alarm ID. Use this search field to quickly find known alarms. This facilitates quick searches to be able to acknowledge alarm emails.
- The **Node Description** search field allows operators to perform partial matches on information for each node's description field.

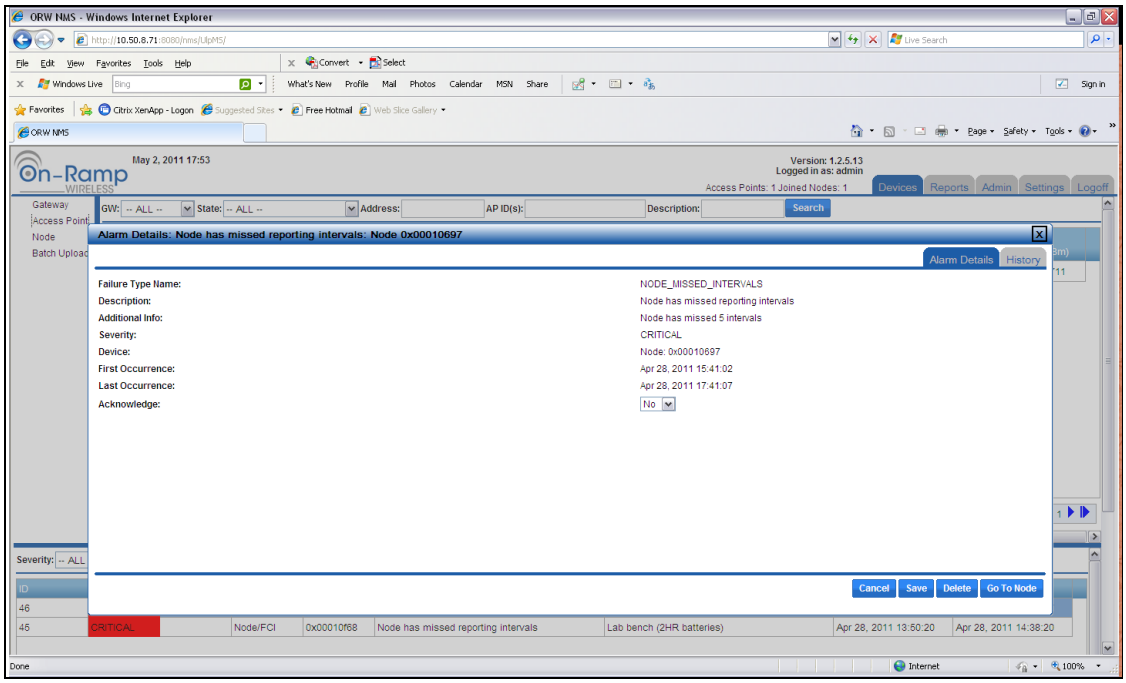
When an alarm has been generated, the EMS operator should acknowledge the alarm before debugging the issue, particularly if email reminders have been enabled as described above in Configuring Alarm Emails.

3.6.4 Acknowledging Alarms

Alarms only need to be acknowledged if the operator previously enabled the EMS to continue to send email alerts for non-acknowledged alarms. If the operator configured the EMS email system to send reminder emails, the system will continue to send email reminders for non-acknowledged alarms at the interval rate specified. Once an alarm has been acknowledged, reminder emails will not be sent for the acknowledged alarm.

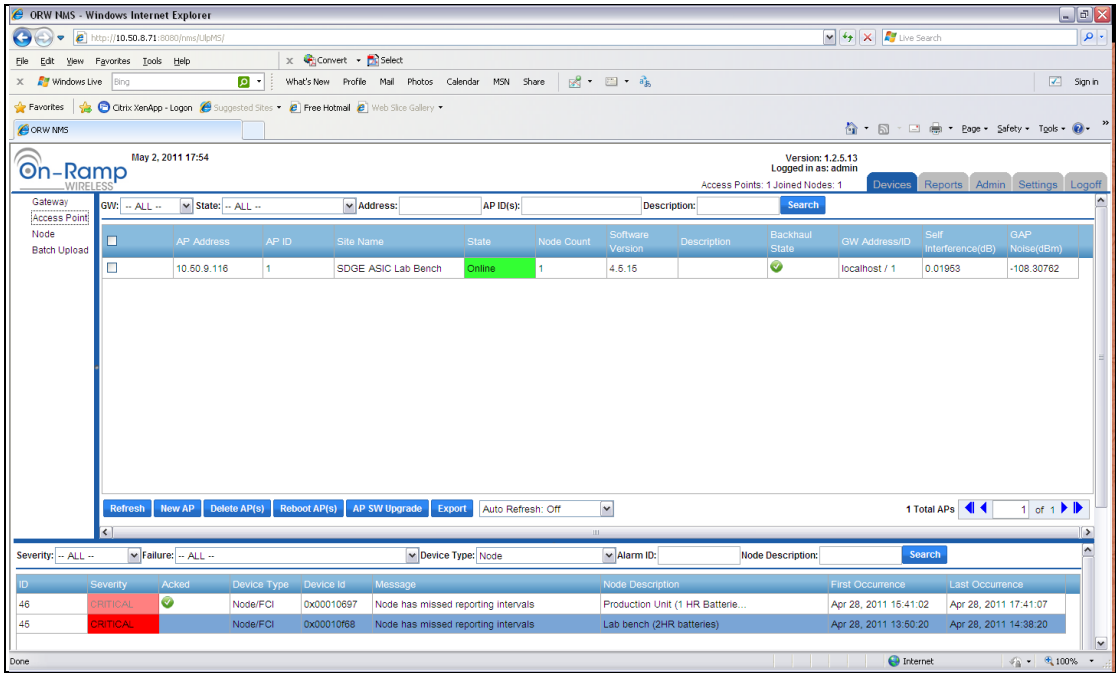
To acknowledge an alarm, complete the following steps:

1. In the alarm pane, select the active alarm.



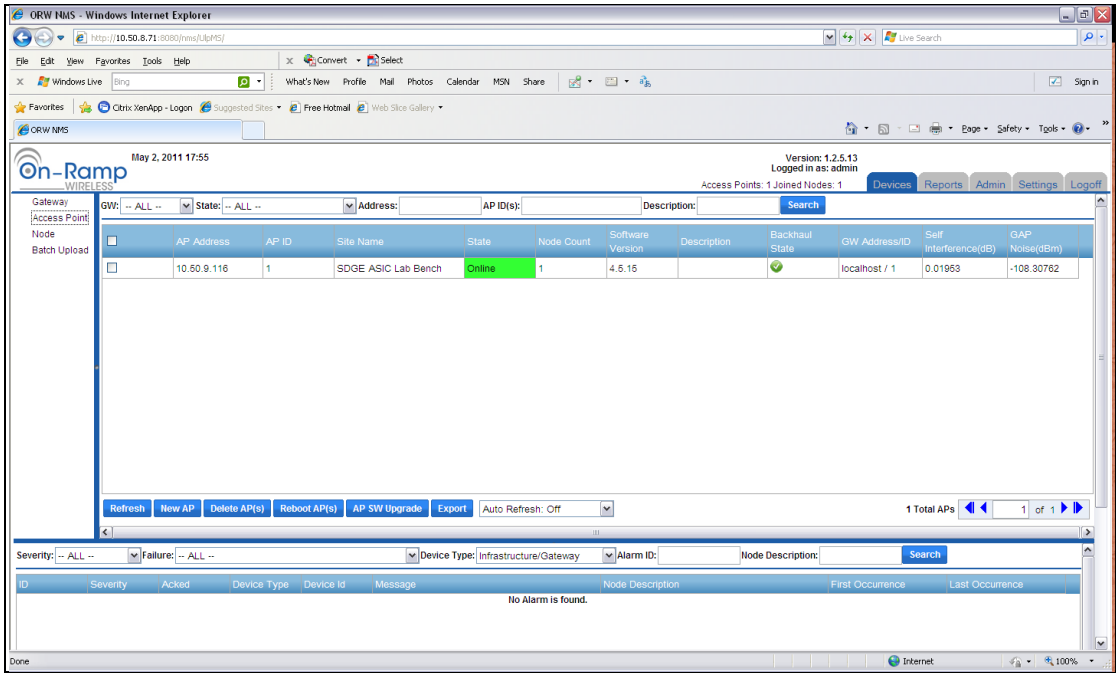
2. In the Alarm Details window, select **Yes** from the Acknowledge drop-down list.
3. Click **Save**. The pop-up window asks the operator to acknowledge the alarm.

4. Click **Yes**.



Depending on the settings for the email system notification group, the operator may receive emails for combinations of acknowledgement, clearing, and/or lack of acknowledgement.

After the cause of the alarm is cleared, the alarm will be cleared. There are not any active alarms displayed in the window.

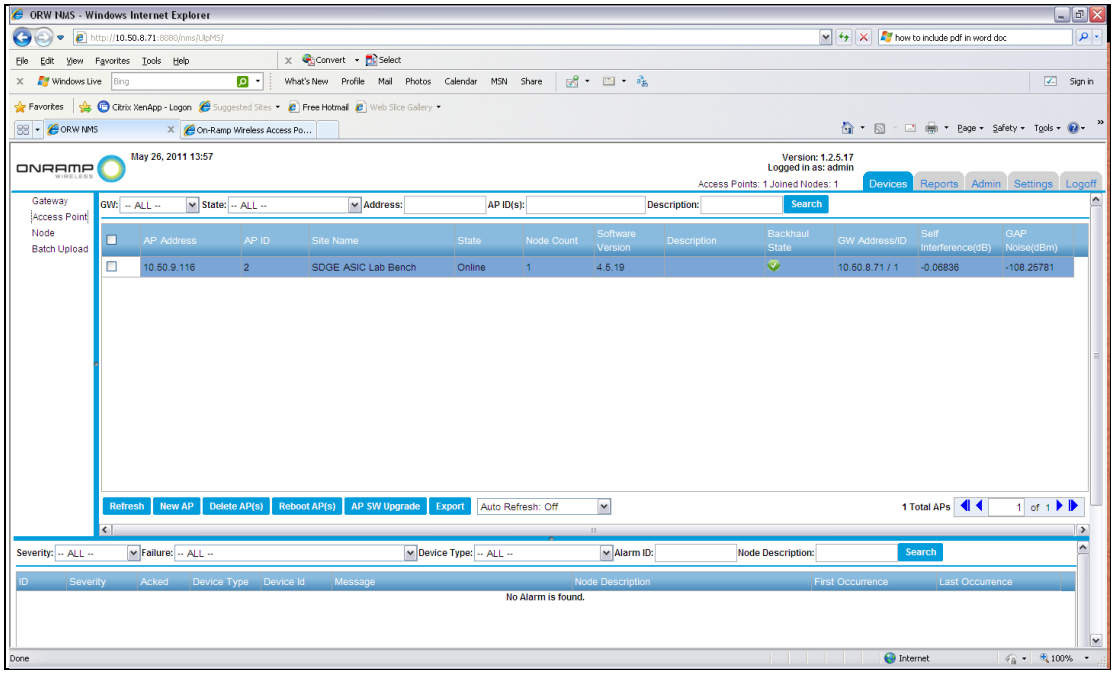


3.6.5 EMS Alarm History

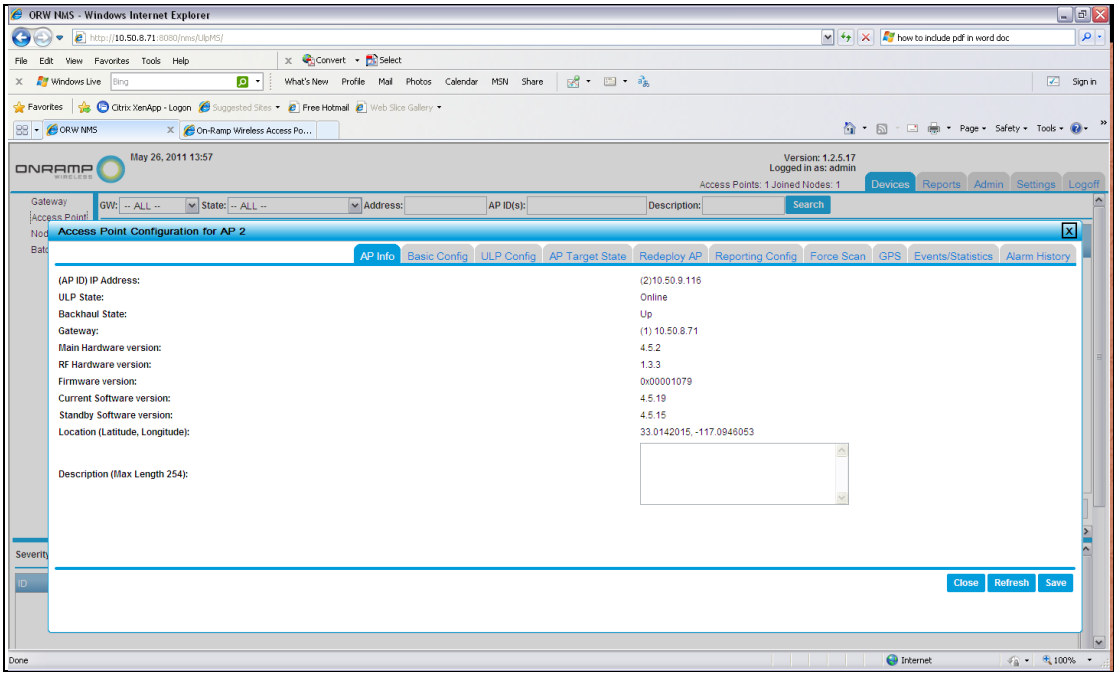
The EMS keeps the history of alarms for each element in the network. To see the alarm history for a device in the network, select a device from the device listing, and navigate to the **Alarm History** for that device. The following process is the same sequence of steps for Gateways, Access Points, or Nodes.

In the following example, look at the alarm history of an Access Point.

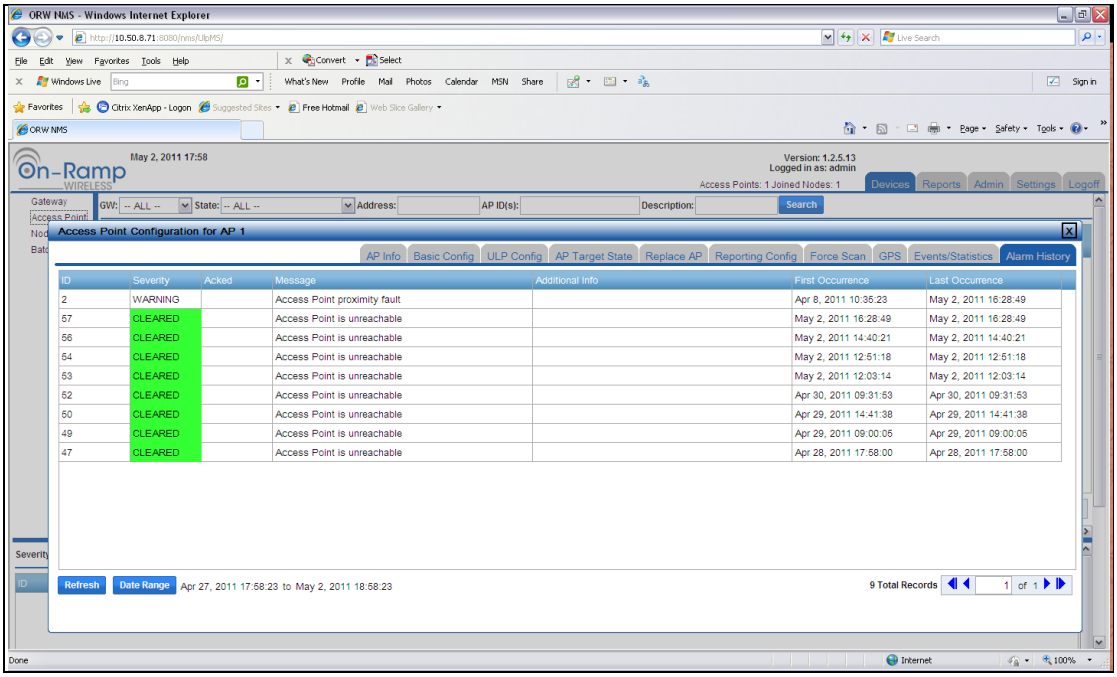
1. To see the history of the alarm, click the **Devices** tab in the main window.
2. To see the APs in the system, click **Access Point** in the Devices pane.



3. From the devices list, select the Access Point.



4. Click the **Alarm History** tab. In the following example, the original alarm is listed and is followed by the Cleared event after the cause for the alarm was fixed.

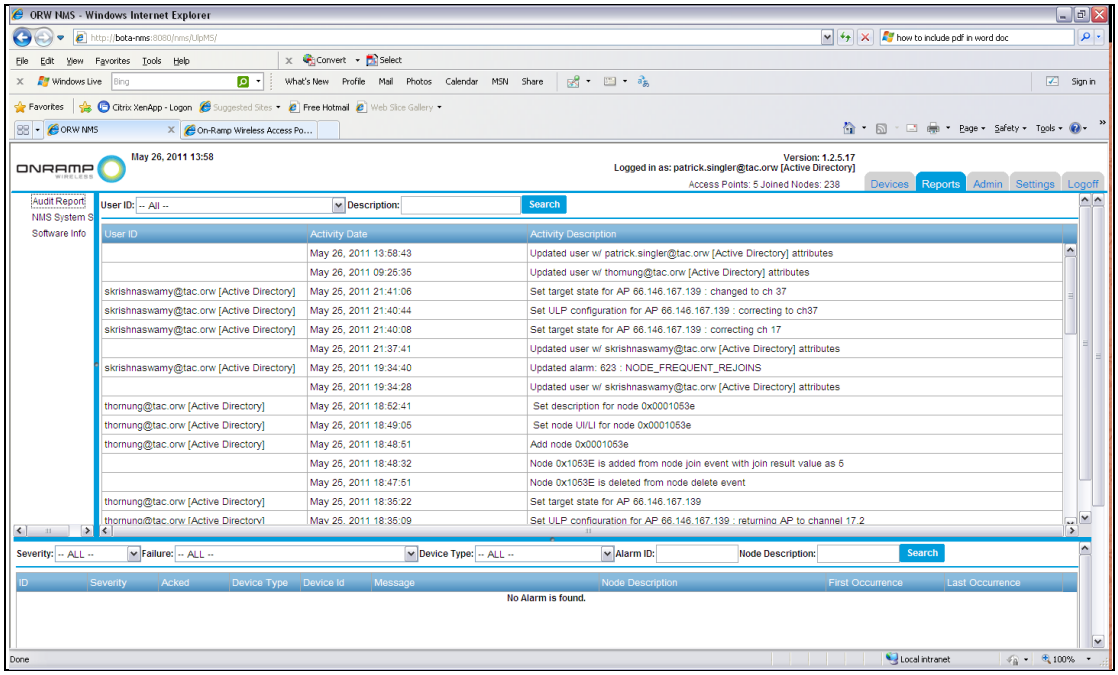


3.7 Audit Reporting

The EMS includes a System Audit Reporting feature. This feature captures a log item each time devices are added, devices are removed, or a ULP system configuration parameter is set and/or changed. This reporting feature is useful when there are multiple system operators who need to verify when system changes may have been made that they are not aware of. This feature also allows system administrators access to a historical record of system configuration changes that is searchable and downloadable for offline processing.

To access the EMS audit reporting capability, complete the following steps:

1. Log in to the EMS with a valid account. Any account type (admin, operator, or guest) can access the EMS audit reporting since there is no capability to change what the system logs.
2. Click the **Reports** tab. If it is not automatically highlighted, select **Audit Report** in the Device Selection Pane.



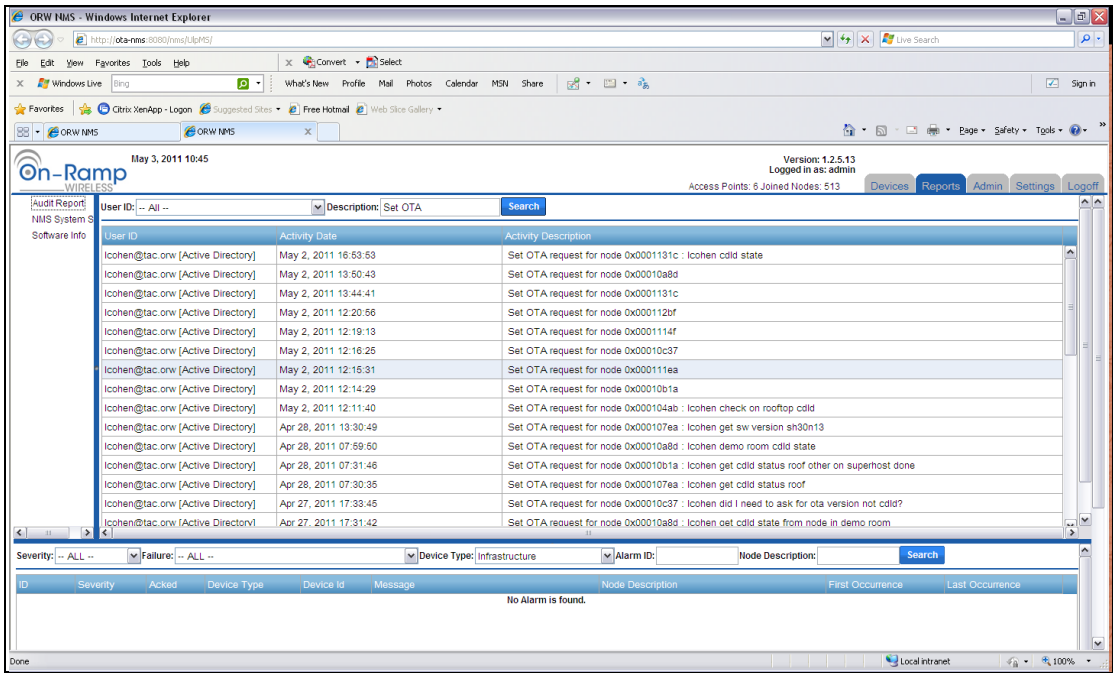
As shown above, the Device Listing Pane of the EMS display shows a list of historical system configuration actions. Each row contains an entry for:

- **User ID**: This field indicates which user account made this change.
- **Activity Date**: This field records what date and time this change was made.
- **Activity Description**: This field records what the user entered in the pop-up window and when the change was made.

To facilitate real-time searches, the top of the Device Listing Pane contains a drop-down list which allows the operator to sort by **User ID**. There is also a **Search** field which allows the operator to search for items in the **Activity Description** field of the audit report.

To facilitate practical searching, each **Activity Description** entry contains two parts to the text captured in the field. For each type of system change, there is a fixed description as well as an optional description that is appended to this field. The optional description is the information that the operator enters in the pop-up window that accompanies a system change.

For example, as shown below, a search was performed on the keyword, **Set OTA.** The search resulted in the following:



There are two types of entries shown.

- Row 1 shows an example that contains the fixed system entry: **Set OTA request for node 0x0001131c** as well as the optional entry that this user made when they affected this system change: **lcohen cdld state**.
- Rows 2-8 show system changes where the user did not enter optional descriptions at the time of the system change.

When using the audit reporting feature of EMS, the date set by the **Date Range** button must include the dates of interest. The **Export** button allows the operator to export the list of items contained in the current **Date Range** setting to a Comma Separated Value (CSV) text file.

Appendix A Typical Email Alert Alarm Email

The EMS alarm system will generate a specific email for each type of alarm that the system can generate. Depending on the configuration of the email system, the operator may receive reminder emails, acknowledgement emails, and cleared emails from the system.

The following four examples show the path of a single type of alarm (NODE FREQUENT REJOIN) and include:

- A NODE FREQUENT REJOIN alarm email
- A reminder for this alarm
- An acknowledgement of this alarm
- An email showing the alarm has been cleared

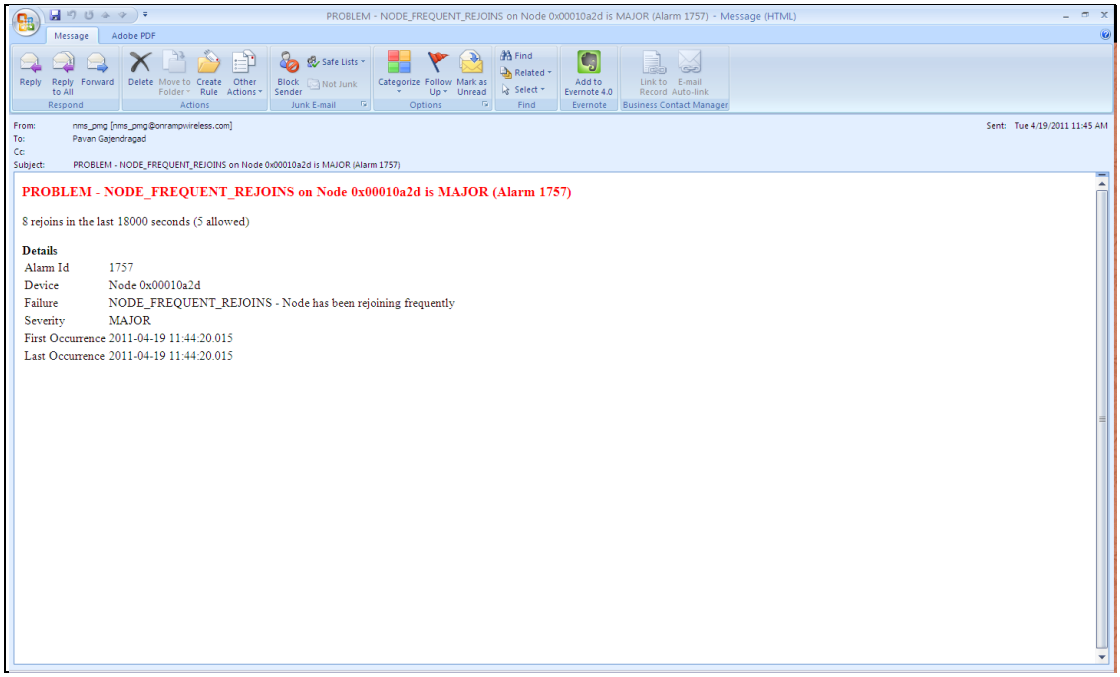


Figure 3. NODE FREQUENT REJOIN Alarm Email

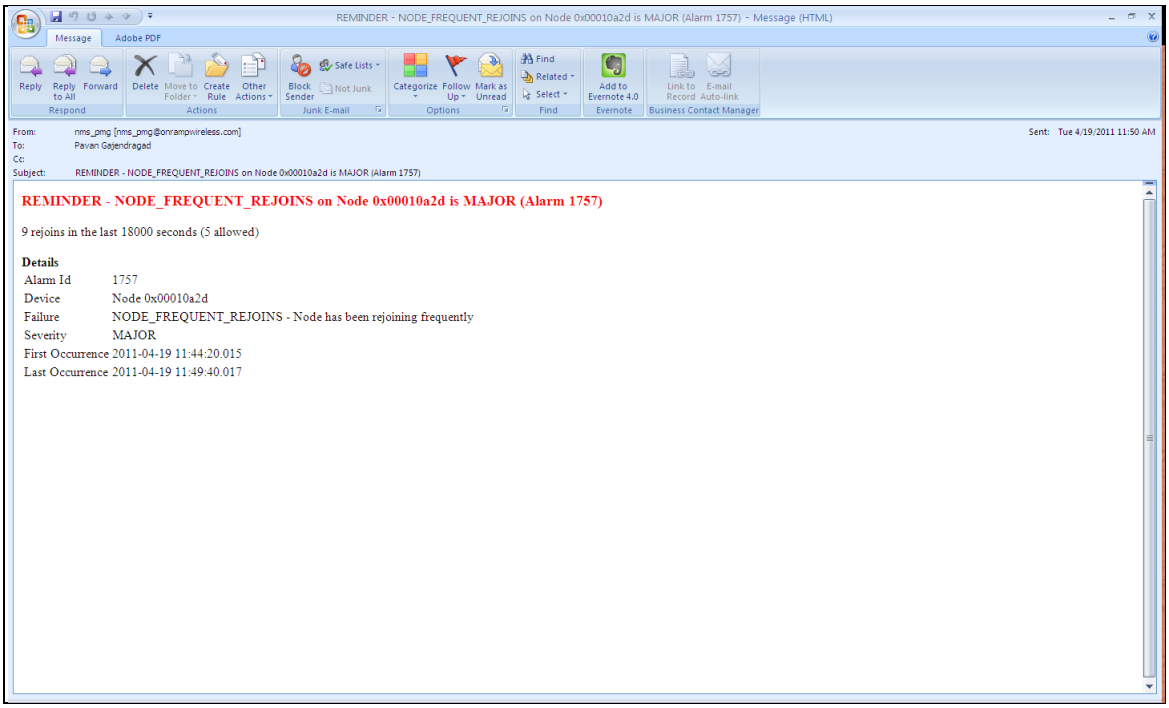


Figure 4. Reminder for the Alarm

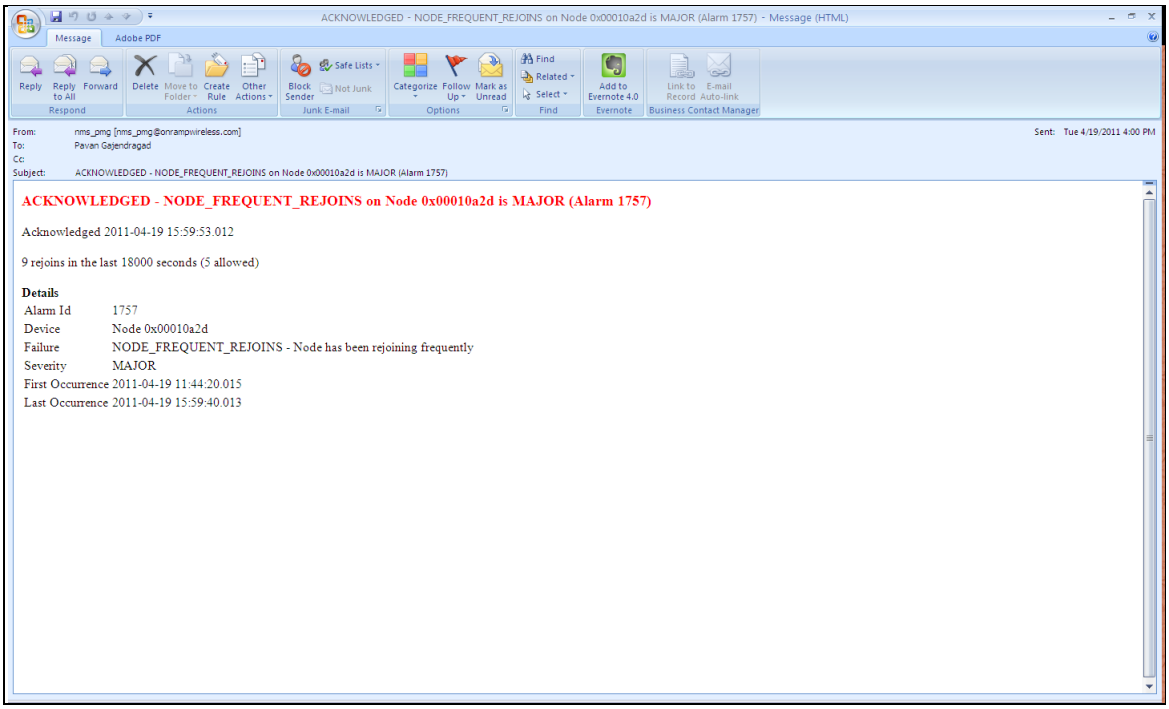


Figure 5. Acknowledgement of the Alarm

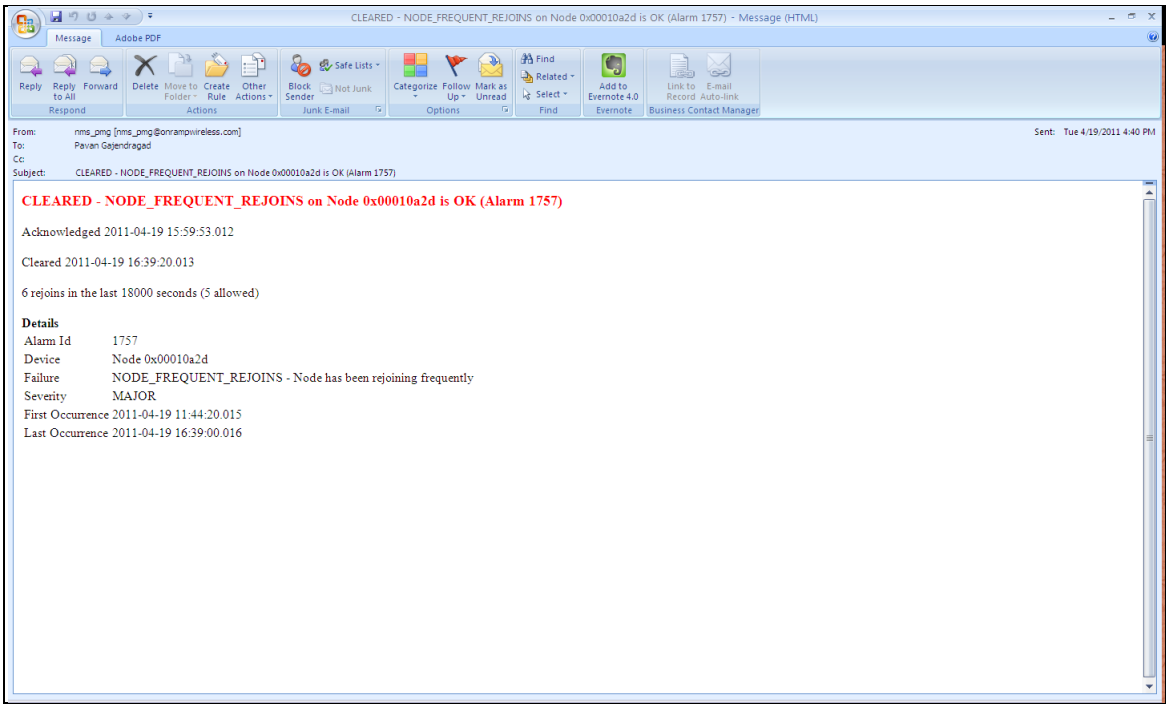


Figure 6. Email Showing the Cleared Alarm

Appendix B New Application Types

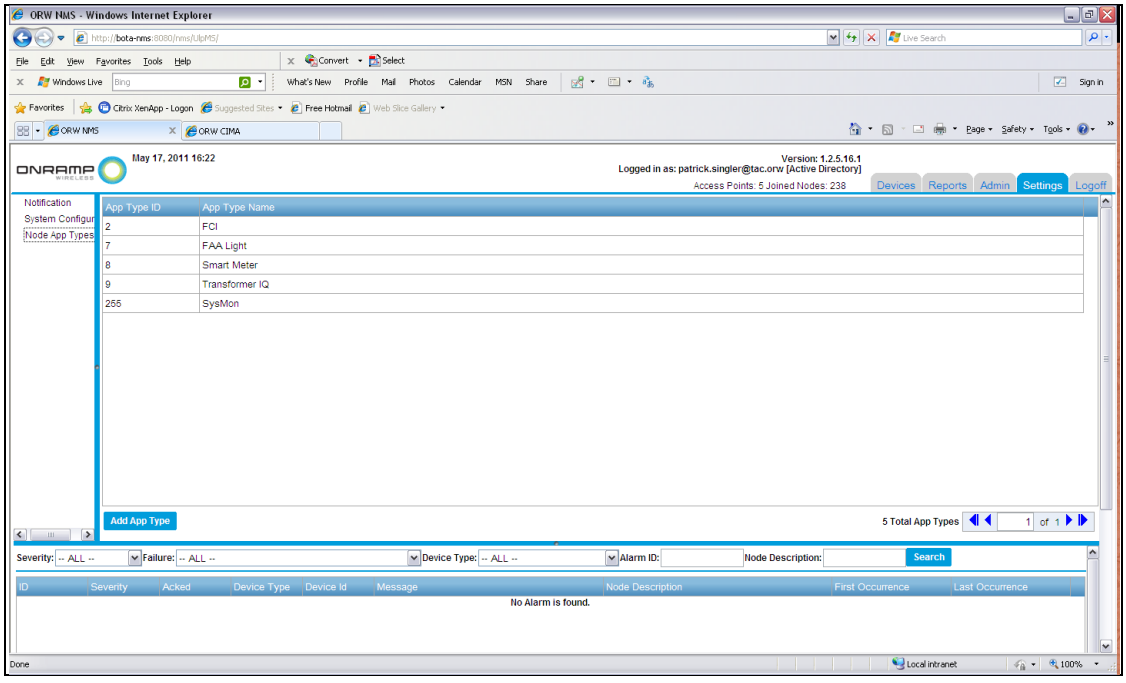
The initial release of the EMS supports the following application types in this documented release:

1. App Type ID: 2 – FCI
2. App Type ID: 7 – FAA
3. App Type ID: 8 – Smart Meter
4. App Type ID: 9 – Transformer IQ
5. App Type ID: 255 – Sysmon
6. App Type ID: 2 – FCI

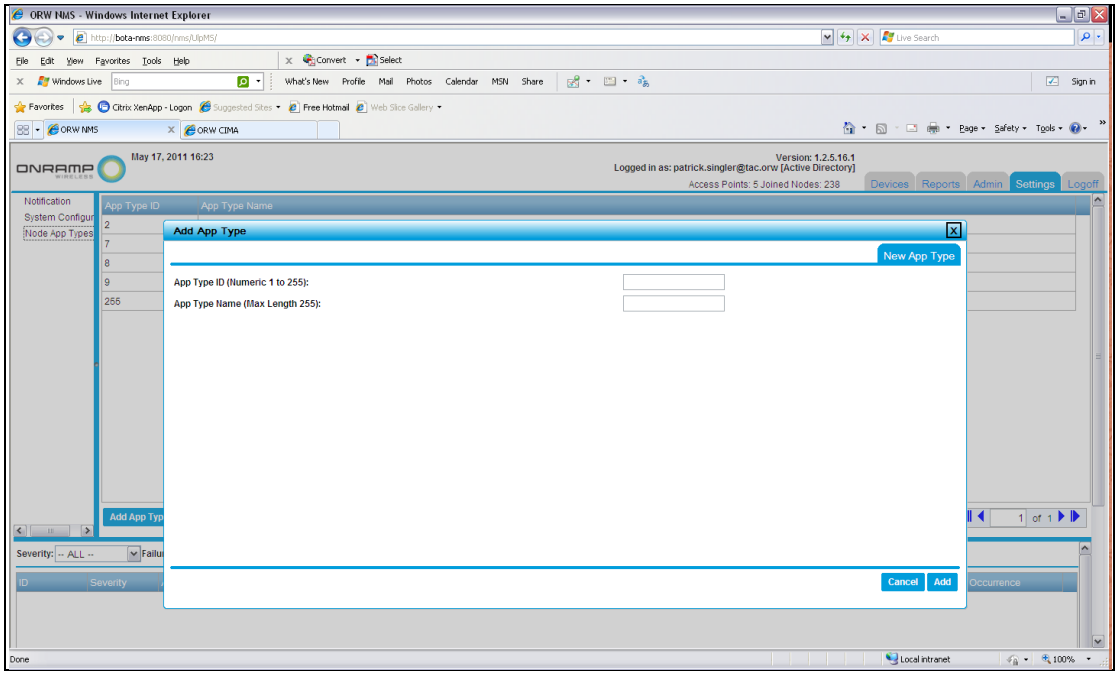
Over time, new applications will be identified to be added to the ULP system. The EMS facilitates a way to add device types to the system.

NOTE: New devices can be added to the EMS and CIMA. For more information about adding new device types to CIMA, see the CIMA Operator Guide.

1. To add a new device type in the EMS, log in as an administrator.
2. Click the **Settings** tab.



3. Select **Add App Type**, and complete the field entries.



Appendix C Abbreviations and Terms

Abbreviation/Term	Definition
AP	Access Point. The ULP network component geographically deployed over a territory.
CIMA	Critical Infrastructure Monitoring Application. The network component that passes data from the Gateway to the associated upstream databases.
CSV	Comma Separated Value
Dashboard	Web page view of the aggregated end-device monitoring data.
DBA	Database Administrator
FCI	Fault Circuit Indicator. The Schweitzer Engineering Laboratories (SEL®) designed end device that remotely monitors distribution lines for voltage and/or current faults.
GW	Gateway. The network appliance that provides a single entry point into the back office for the ULP network. A gateway talks upstream to the EMS and CIMA. It talks downstream to multiple APs.
IT	Information Technology
KMS	Key Management Server
EMS	Element Management System. The network component that provides a concise view of the ULP network for controls and alarms.
Node	The generic term used interchangeably with end point device.
ORW	On-Ramp Wireless
RMU	Remote Monitoring Unit. The end device that monitors Federal Aviation Administration (FAA) obstruction lights.
TCP/IP	Transmission Control Protocol/Internet Protocol
ULP	Ultra-Link Processing. The ORW proprietary wireless communication technology.