Aruba and AirWave 7.5

Best Practices Guide

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Contents

Preface

The preface provides an overview of the best practices guide and contact information for Aruba, and includes the following sections:

- "Document Organization" on page 1
- "Note, Caution, and Warning Icons" on page 2
- "Contacting Support" on page 2

Document Organization

This best practices guide includes instructions and examples of optimal ways to use and integrate the AirWave Management Platform (AMP) with Aruba devices and infrastructure.

Table 1 *Document Organization and Purposes*

Chapter	Description
Chapter 1, "Overview" on page 3	This chapter explains the minimum requirements, prerequisites, topology of an Aruba infrastructure integrated with AMP.
Chapter 2, "Configuring AirWave for Aruba Infrastructure" on page 7	This chapter explains global configuration options in AMP.
Chapter 3, "Configuring an Aruba Group in AMP" on page 11	This chapter explains how to create and monitor an Aruba group in AMP.
Chapter 4, "" on page 13	This chapter explains how to discover and manage your Aruba infrastructure.
Chapter 5, "AMP and Aruba Integration Strategies" on page 17	This chapter highlights recommended integration strategies.
Chapter 6, "Aruba-Specific Capabilities in AMP" on page 25	This chapter highlights AMP capabilities that are specific to Aruba devices.
Appendix A, "ArubaOS and AMP CLI Commands" on page 33	This appendix explains command line interface (CLI) commands.
Appendix B, "AMP Data Acquisition Methods" on page 37	This appendix provides a table that explains how AMP acquires data from Aruba devices.
Appendix C, "WMS Offload Details" on page 39	This appendix explains WMS Offload in further detail.
Appendix D, "Increasing Location Accuracy" on page 41	This appendix explains ways to increase location accuracy in AMP.

Note, Caution, and Warning Icons

This document uses the following notice icons to emphasize advisories for certain actions, configurations, or concepts:

NOTE

Indicates helpful suggestions, pertinent information, and important things to remember.

CAUTION

Indicates a risk of damage to your hardware or loss of data.

WA

Indicates a risk of personal injury or death.

Contacting Support

Main Site	arubanetworks.com
Support Site	support.arubanetworks.com
North American Telephone	1-800-943-4526 (Toll Free) 1-408-754-1200
International Telephones	arubanetworks.com/support-services/aruba-support-program/contact-support/
Software Licensing Site	licensing.arubanetworks.com/login.php
Wireless Security Incident Response Team (WSIRT)	arubanetworks.com/support/wsirt.php
Support Emails	
Americas and APAC	support@arubanetworks.com
EMEA	emea_support@arubanetworks.com
WSIRT Email Please email details of any security problem found in an Aruba product.	wsirt@arubanetworks.com

Chapter 1

Overview

This document provides best practices for leveraging AirWave to monitor and manage your Aruba infrastructure. Aruba wireless infrastructure provides a wealth of functionality such as firewall, VPN, remote AP, IDS, IPS, and ARM, as well as an abundance of statistical information.

Follow the simple guidelines in this document to garner the full benefit of your Aruba infrastructure.

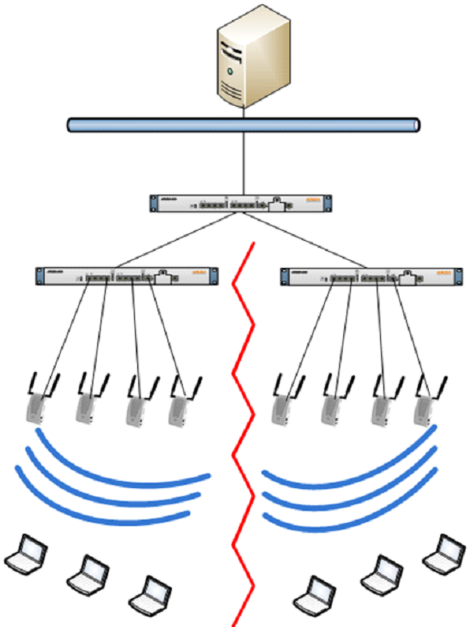
This overview chapter contains the following topics:

- "Understanding Aruba Topology" on page 3
- "Prerequisites for Integrating Aruba Infrastructure" on page 3
- "Feature Implementation Schedule" on page 4

Understanding Aruba Topology

Figure 1 depicts typical master-local deployment for the AirWave Wireless Management System (AWMS):

Figure 1 *Typical Aruba Deployment*



Component	Without AWMS	With AWMS
AWMS		AWMS communicates directly with local and master controllers to gather and correlate statistics
Master Controller	Correlates all state information from all downstream access points	Functions as a local controller
Local Controllers	Collect downstream AP statistical information	Collect downstream AP statistical and state information
Thin APs	Send all state information to the Master Controller	Send all state information to Local Controller

NOTE

There should never be a local controller managed by an AMP server whose master controller is also not under management.

Prerequisites for Integrating Aruba Infrastructure

You will need the following information to monitor and manage your Aruba infrastructure:

- SNMP community string (monitoring and discovery)
- Telnet/SSH credentials (configuration only)

- **enable** password (configuration only)

NOTE

Without proper Telnet/SSH credentials AMP will not be able to acquire license and serial information from controllers.

- SNMPv3 credentials are required for WMS Offload:
  - Username
  - Auth password
  - Privacy password
  - Auth protocol

Feature Implementation Schedule

The following table describes the feature implementation schedule for AMP:

Table 2 *Feature Implementation Schedule for AMP*

Feature	AMP Implementation
Ability to filter User Session by ArubaOS roles	7.0
ArubaOS 5.0 support	7.0
RAP white list management for RN 3.1	7.0
Added support for rogue containment	7.0
Added support for configuring controller specific overrides	7.0
Client dot11counter status	7.0
Added support for AP-92 and AP-93	7.1
Ability to use controller WIPS classification within RAPIDS	7.1
Use controller classification/confidence level within a RAPIDS rule	7.1
ArubaOS provides Ad-Hoc rogues and encryption type	7.1
Channel Utilization	7.1
AP dot11counter statistics	7.1
Support for SNMPv3 informs	7.1
Track BW on wired users connected to RAPs	7.1
Ability to configure SNMP local configuration	7.1
Ability to track ARM power and channel changes	7.2
Ability to track Noise Floor	7.2
Ability to track Interfering Devices	7.2
Ability to store and display ARM logs	7.2

Table 2 *Feature Implementation Schedule for AMP (Continued)*

Feature	AMP Implementation
Ability to track user associations and roaming via SNMP traps	7.2
Ability to pull Channel Summary CLI statistics from controller	7.2
AMP requires a 64-bit operating system	7.3
VisualRF and RAPIDS are now standard part of the AMP	7.3
System > Syslog and Traps page has been added to display all syslog messages and SNMP traps that AMP receives	7.3
Aruba Mobile Device Access Control (MDAC) secures, provisions and manages network access for Apple® iOS and other employee-owned mobile devices by enabling device fingerprinting, device registration, and increased device visibility	7.3
Basic monitoring support for wired users on the new Aruba Mobility Access Switch.	7.3
Support for Aruba AirMesh	7.3
Session-based authentication in AMP (login/logout)	7.3
Ability to filter on list tables (new funnel icon)	7.3
Device Type filtering on reports	7.3
Interferer location ability	7.3
Added Open controller web UI drop-down menu to the APs/Devices > Monitor and Users > User Detail pages for Aruba devices	7.3
Single Sign-On Between AirWave and Aruba devices	7.4
VPN User monitoring, including Aruba VIA	7.4
Configuration for standalone and stacked Aruba Mobility Access Switch	7.4
Extended support for Aruba Instant	7.4
Extended support for Remote Access Points (RAPs)	7.4
Mesh support for Aruba AP-175	7.4
Support for Aruba Instant 6.1.3.1-3.0.0.0	7.5
Authentication with LDAP	7.5
Recurring Configuration Changes	7.5
Configurable Authentication Priority	7.5
Configurable Mail Relay Server	7.5

Chapter 2

Configuring AirWave for Aruba Infrastructure

This chapter explains how to optimally configure AirWave to globally manage your global Aruba infrastructure, and contains the following topics:

- "Disabling Rate Limiting in AMP Setup > General" on page 7
- "Entering Credentials in Device Setup > Communication" on page 7
- "Setting Up Recommended Timeout and Retries" on page 9
- "Setting Up Time Synchronization" on page 9
- "Enabling Support for Channel Utilization And Statistics" on page 10

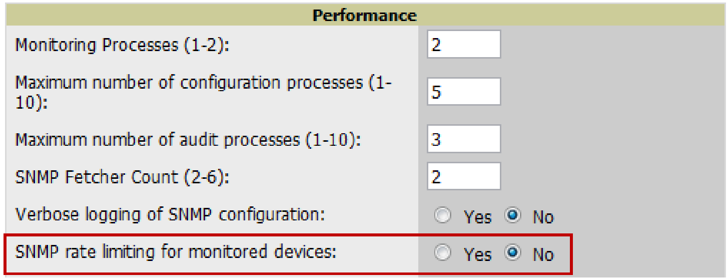
Disabling Rate Limiting in AMP Setup > General

The SNMP Rate Limiting for Monitored Devices option adds a small delay between each SNMP GET request, thus the actual polling intervals will be longer than what is configured. For example, setting a 10-minute polling interval will result in an actual 12-minute polling interval. Disabling rate limiting is recommended in most cases unless you are using legacy Aruba devices, such as M2 devices.

To disable rate limiting in AirWave, follow these steps:

1. Navigate to **AMP Setup > General**.
2. Locate the **Performance** section on this page.
3. In the **SNMP Rate Limiting for Monitored Devices** field, select **No**, as shown in Figure 2.
4. Select **Save**.

Figure 2 *SNMP Rate Limiting in* ***AMP Setup > General***



Performance

Monitoring Processes (1-2):	2
Maximum number of configuration processes (1-10):	5
Maximum number of audit processes (1-10):	3
SNMP Fetcher Count (2-6):	2
Verbose logging of SNMP configuration:	○ Yes ● No
SNMP rate limiting for monitored devices:	○ Yes ● No

Entering Credentials in Device Setup > Communication

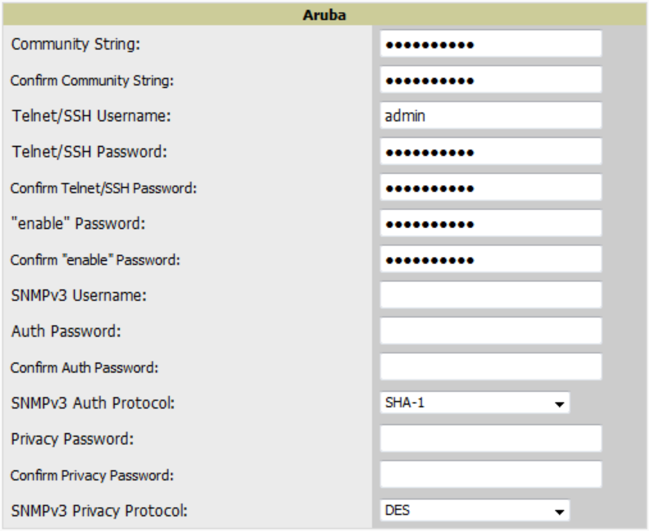
AMP requires several credentials to properly interface with Aruba devices. To enter these credentials, follow these steps:

1. Navigate to **Device Setup > Communication**.
2. In the **Default Credentials** section, select the **Edit** link next to **Aruba**. The page illustrated in Figure 3 appears.
3. Enter the **SNMP Community String**.

NOTE

Be sure to note the community string, because it must match the SNMP trap community string which is configured later in this document.

Figure 3 *Aruba Credentials in* ***Device Setup*** **>** ***Communication***



Aruba

Community String: ••••••••••
Confirm Community String: ••••••••••
Telnet/SSH Username: admin
Telnet/SSH Password: ••••••••••
Confirm Telnet/SSH Password: ••••••••••
"enable" Password: ••••••••••
Confirm "enable" Password: ••••••••••
SNMPv3 Username:
Auth Password:
Confirm Auth Password:
SNMPv3 Auth Protocol: SHA-1
Privacy Password:
Confirm Privacy Password:
SNMPv3 Privacy Protocol: DES

4. Enter the required fields for configuration and basic monitoring:
   - Telnet/SSH Username
   - Telnet/SSH Password
   - “enable” Password
5. Enter the required fields for WMS Offload:
   - SNMPv3 Auth Protocol
   - SNMPv3 Privacy Protocol
   - SNMPv3 Username
   - Auth Password
   - Privacy Password

NOTE

The protocols should be SHA and DES in order for WMS Offload to work.

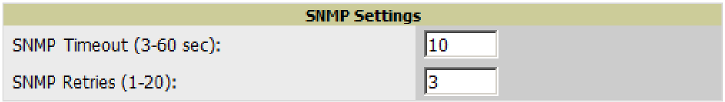
6. When finished, select **Save**.

Setting Up Recommended Timeout and Retries

To set recommended timeout and retries settings, follow these steps:

1. In the **Device Setup > Communication** page, locate the **SNMP Setting** section.
2. Change **SNMP Timeout** setting to **10**.
3. Change **SNMP Retries** to **1**.

Figure 4 *Timeout settings in **Device Setup > Communication***



SNMP Settings

SNMP Timeout (3-60 sec): 10

SNMP Retries (1-20): 3

4. Select **Save**.

Setting Up Time Synchronization

Setting up NTP on AirWave

On the **AMPSetup > Network** page, locate the **Network Time Protocol (NTP)** section. The Network Time Protocol is used to synchronize the time between AirWave and your network reference NTP server. NTP servers synchronize with external reference time sources, such as satellites, radios, or modems.

NOTE

Specifying NTP servers is optional. NTP servers synchronize the time on the AMP server, not on individual access points.

To disable NTP services, clear both the **Primary** and **Secondary** NTP server fields. Any problem related to communication between AMP and the NTP servers creates an entry in the event log. For more information on ensuring that AirWave servers have the correct time, please see http://support.ntp.org/bin/view/Servers/NTPPoolServers.

Table 3 ***AMPSetup >Network > Secondary Network** Fields and Default Values*

Setting	Default	Description
Primary	ntp1.yourdomain.com	Sets the IP address or DNS name for the primary NTP server.
Secondary	ntp2.yourdomain.com	Sets the IP address or DNS name for the secondary NTP server.

You can set the clock on a controller manually or by configuring the controller to use a Network Time Protocol (NTP) server to synchronize its system clock with a central time source.

Manually Setting the Clock on a Controller

You can use either the WebUI or CLI to manually set the time on the controller's clock.

1. Navigate to the **Configuration > Management > Clock** page.
2. Under **Controller Date/Time**, set the date and time for the clock.
3. Under **Time Zon**e, enter the name of the time zone and the offset from Greenwich Mean Time (GMT).
4. To adjust the clock for daylight savings time, click **Enabled** under Summer Time. Additional fields appear that allow you to set the offset from UTC, and the start and end recurrences.
5. Click **Apply**.

Enabling Support for Channel Utilization And Statistics

In order to enable support for channel utilization statistics, you must have the following:

- AirWave 7.2 or later
- ArubaOS 6.0.1 or later

NOTE

ArubaOS 6.0.1 can report RF utilization metrics, while ArubaOS 6.1 is necessary to also obtain classified interferer information.

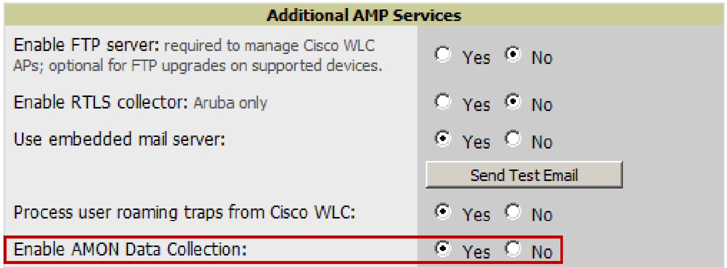
- Access points - Aruba AP-105, AP-92, AP-93, AP-125, AP-124, AP-134, AP-135
- Controllers - Aruba 600 Series, 3000 Series, or 6000 Series

AirWave Setup

Follow these steps in AMP:

1. Navigate to **AMP Setup > General.**
2. In the **Additional AMP Services** section, set **Enable AMON Data Collection** to **Yes**, as shown in Figure 5:

Figure 5 *AMON Data Collection setting in **AMP Setup> General***



Additional AMP Services

Enable FTP server: required to manage Cisco WLC APs; optional for FTP upgrades on supported devices. ○ Yes ● No

Enable RTLS collector: Aruba only ○ Yes ● No

Use embedded mail server: ● Yes ○ No

Process user roaming traps from Cisco WLC: ● Yes ○ No

Enable AMON Data Collection: ● Yes ○ No

3. Select **Save**.

Controller Setup (Master And Local)

CAUTION

Enabling these commands on ArubaOS versions prior to 6.0.1.0 can result in performance issues on the controller. If you are running previous firmware versions such as ArubaOS 6.0.0.0, you should upgrade to ArubaOS 6.0.1 (to obtain RF utilization metrics) or 6.1 (to obtain RF utilization *and* classified interferer information) before you enter this command.

Use SSH to access the controller’s command-line interface, enter **enable** mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z
(Controller-Name) (config) # mgmt-server type amp primary-server <AMP-IP>
(Controller-Name) (config) # write mem
```

Chapter 3

Configuring an Aruba Group in AMP

It is prudent to establish one or more Aruba Groups within AMP. During the discovery process you will move new discovered controllers into this group.

This chapter contains the following topics:

- "Basic Monitoring Configuration" on page 11
- "Advanced Configuration" on page 12

Basic Monitoring Configuration

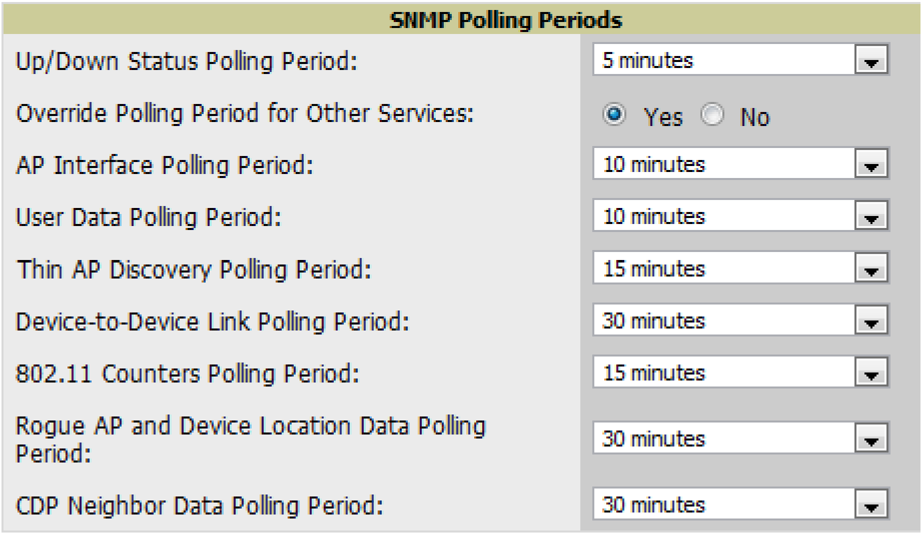
1. Navigate to **Groups** > **List.**
2. Select **Add**.
3. Enter a **Name** that represents the Aruba device infrastructure from a security, geographical, or departmental perspective and select **Add**.
4. You will be redirected to the **Groups > Basic** page for the Group you just created. On this page you will need to tweak a few Aruba-specific settings.
5. Find the **SNMP Polling Periods** section of the page, as illustrated in Figure 6.
6. Change **Override Polling Period for Other Services** to **Yes.**
7. Ensure **User Data Polling Period** is set to 10 minutes. Do not configure this interval lower than 5 minutes.

NOTE

Enabling the SNMP Rate Limiting for Monitored Devices option in the previous chapter adds a small delay between each SNMP Get request, thus the actual polling interval is 12 minutes for 10 minute polling interval.

8. Change **Device-to-Device Link Polling Period** to **30 minutes.**
9. Change **Rogue AP and Device Location Data Polling Period** to **30 minutes.**

Figure 6 *SNMP Polling Periods section of* ***Groups > Basic***

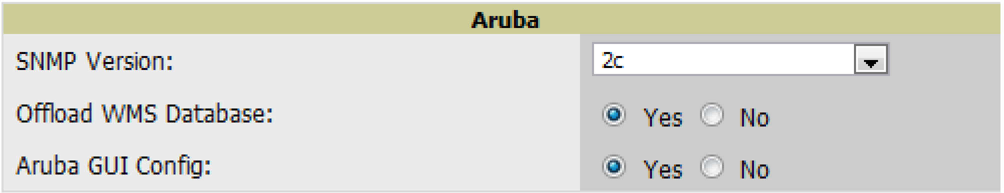


SNMP Polling Periods	
Up/Down Status Polling Period:	5 minutes
Override Polling Period for Other Services:	● Yes ○ No
AP Interface Polling Period:	10 minutes
User Data Polling Period:	10 minutes
Thin AP Discovery Polling Period:	15 minutes
Device-to-Device Link Polling Period:	30 minutes
802.11 Counters Polling Period:	15 minutes
Rogue AP and Device Location Data Polling Period:	30 minutes
CDP Neighbor Data Polling Period:	30 minutes

10. Locate the **Aruba** section of this page, as illustrated in Figure 7.

11. Configure the proper **SNMP Version** for monitoring the Aruba infrastructure.

Figure 7 *Group SNMP Version for Monitoring*



Aruba

SNMP Version: 2c

Offload WMS Database: ● Yes ○ No

Aruba GUI Config: ● Yes ○ No

12. Select **Save and Apply.**

Advanced Configuration

Refer to the *Aruba and AirWave 7.5 Configuration Guide* located at **Home > Documentation** for detailed instructions.

Chapter 4

Discovering Aruba Infrastructure

AMP utilizes Aruba's topology to efficiently discover downstream infrastructure.This chapter guides you through the process of discovering and managing your Aruba device infrastructure.

Refer to the following earlier chapters in this book before attempting discovery:

- Chapter 2, “Configuring AirWave for Aruba Infrastructure” on page 7
- Chapter 3, “Configuring an Aruba Group in AMP” on page 11

The following topics in this chapter walk through the basic procedure for discovering and managing Aruba Infrastructure:

- “Discovering Master Controllers” on page 13
- “Local Controller Discovery” on page 15
- “Thin AP Discovery” on page 15

NOTE

Always add one controller and its affiliated Thin APs into management or monitoring mode in a serial fashion, one at a time. Adding new devices is a very CPU intensive process for AMP and can quickly overwhelm all of the processing power of the server if hundreds of Thin APs are added (migrated from New to Managed or Monitoring) simultaneously.

Discovering Master Controllers

Scan networks containing Aruba master controllers from **Device Setup > Discover.**

- or -

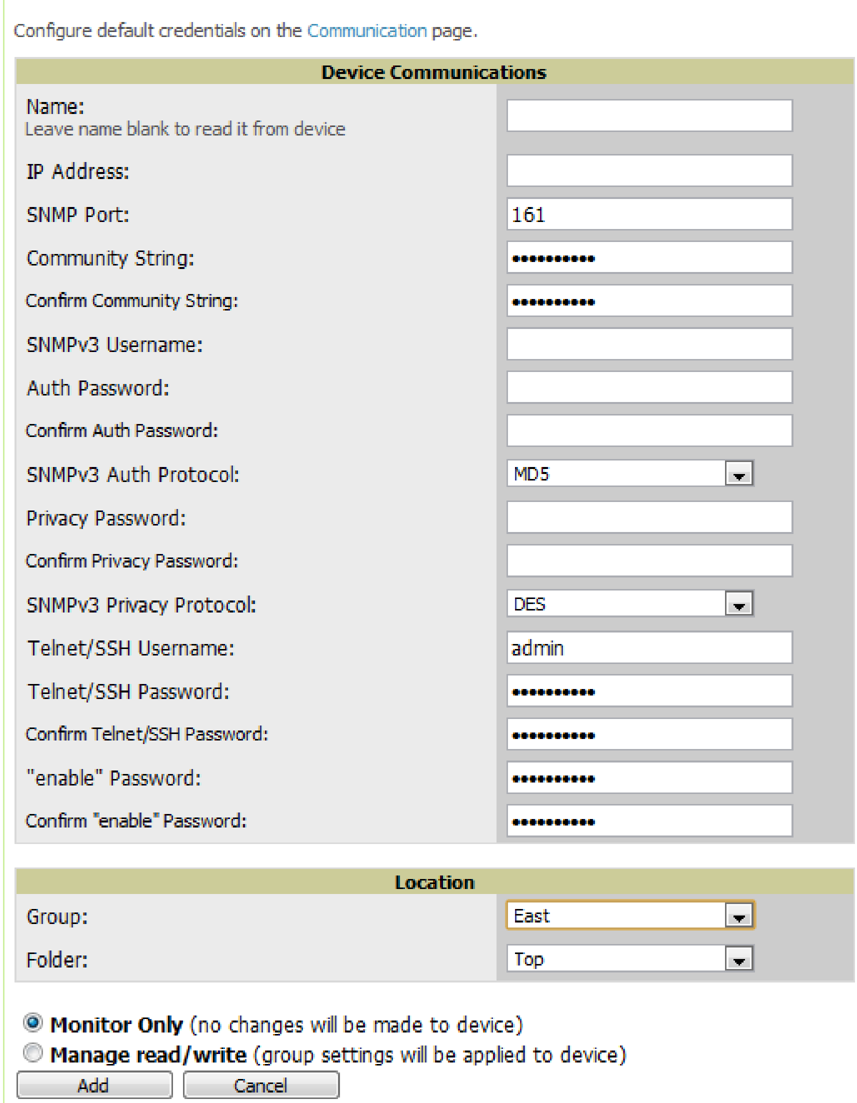
Manually enter the master controller by following these steps in the **Device Setup > Add** page:

1. Select the **Aruba Controller** type and select **Add**. The page illustrated on Figure 8 appears.
2. Enter the **Name** and the **IP Address** for the controller.
3. Enter **SNMP Community String**, which is required field for device discovery.

NOTE

Be sure to note the community string, because it must match the SNMP trap community string which is configured later in this document.

Figure 8 *Aruba Credentials in* ***Device Setup** > **Add***



Configure default credentials on the Communication page.

Device Communications

Name: Leave name blank to read it from device	
IP Address:	
SNMP Port:	161
Community String:	•••••••••••
Confirm Community String:	•••••••••••
SNMPv3 Username:	
Auth Password:	
Confirm Auth Password:	
SNMPv3 Auth Protocol:	MD5
Privacy Password:	
Confirm Privacy Password:	
SNMPv3 Privacy Protocol:	DES
Telnet/SSH Username:	admin
Telnet/SSH Password:	•••••••••••
Confirm Telnet/SSH Password:	•••••••••••
"enable" Password:	•••••••••••
Confirm "enable" Password:	•••••••••••

Location

Group:	East
Folder:	Top

● **Monitor Only** (no changes will be made to device)

○ **Manage read/write** (group settings will be applied to device)

4. Enter the required fields for configuration and basic monitoring:
   - Telnet/SSH Username
   - Telnet/SSH password
   - “enable” password
5. Enter the required fields for WMS Offload
   - SNMPv3 Auth Protocol
   - SNMPv3 Privacy Protocol
   - SNMPv3 Username
   - Auth Password
   - Privacy Password

NOTE

The protocols should be SHA and DES in order for WMS Offload to work.

CAUTION

Caution: If you are using SNMPv3 and the controller's date/time is incorrect, the SNMP agent will not respond to SNMP requests from AMP SNMP manager. This will result in the controller and all of its downstream access points showing as Down in AMP.

6. Assign controller to a Group and Folder.
7. Ensure **Monitor Only** option is selected.
8. Select **Add.**
9. Navigate to **APs/Devices > New** page.
10. Select the Aruba master controller you just added from the list of new devices.
11. Ensure **Monitor Only** option is selected.
12. Select **Add**.

Local Controller Discovery

Local controllers are added to AMP via the master controller, by a discovery scan, or manually added in **Device Setup > Add**. After waiting for the Thin AP Polling Period interval or executing a Poll Now command from the **APs/Devices > Monitor** page, the local controllers will appear on the **APs/Devices > New** page.

Add the local controller to the Group defined previously. Within AMP, local controllers can be split away from the master controller's Group.

NOTE

Local Controller Discovery/monitoring may not work as expected if AirWave is unable to communicate directly with the target device. Be sure and update any ACL/Firewall rules to allow AirWave to communicate with your network equipment.

Thin AP Discovery

Thin APs are discovered via the local controller. After waiting for the Thin AP Polling Period or executing a Poll Now command from the **APs/Devices > Monitor** page, thin APs will appear on the **APs/Devices > New** page.

Add the thin APs to the Group defined previously. Within AirWave, thin APs can be split away from the controller's Group. You can split thin APs into multiple Groups if required.

Chapter 5

AMP and Aruba Integration Strategies

This chapter describes strategies for integrating AMP and Aruba devicesand contains the following topics:

Integration Goals

The following table summarizes the types of integration goals and strategies for meeting them in certain architectural contexts:

Table 4 *Integration Goals in All Masters or Master/Local Architectures*

Integration Goals	All Masters Architecture	Master/ Local Architecture
Rogue And Client Info		enable stats
Rogue containment only	ssh access to controllers	ssh access to controllers
Rogue And Client containment	WMS Offload	WMS Offload
Reduce Master Controller Load		WMS Offload debugging off
IDS And Auth Tracking	Define AMP as trap host	Define AMP as trap host
Track Tag Location	enable RTLS WMS Offload	enable RTLS WMS Offload
Channel Utilization	enable AMON	enable AMON
Spectrum	enable AMON	enable AMON

Key integration points to consider include the following:

- IDS Tracking does not require WMS Offload in an all-master or master/local environment.
- IDS Tracking does require enable stats in a master/local environment.
- WMS Offload will hide the Security Summary tab on master controller's web interface.
- WMS Offload encompasses enable stats or enable stats is a subset of WMS Offload.
- Unless you enable stats on the local controllers in a master/local environment, the local controllers do not populate their MIBs with any information about clients or rogue devices discovered/associated with their APs. Instead the information is sent upstream to master controller.

Example Use Cases

The following are example use cases of integration strategies:

When to Use Enable Stats

You want to pilot AMWS and doesn't want to make major configuration changes to their infrastructure or manage configuration from AMP.

NOTE

Enable Stats still pushes a small subset of commands to the controllers via SSH.

See "Enable Stats Utilizing AMP" on page 19.

When to Use WMS Offload

- You have older Aruba infrastructure in a master/local environment and their master controller is fully taxed. Offloading WMS will increase the capacity of the master controller by offloading statistic gathering requirements and device classification coordination to AMP.
- You want to use AMP to distribute client and rogue device classification amongst multiple master controllers in a master/local environment or in an All-Masters environment.
- See the following topics:
  - "WMS Offload With AMP" on page 20
  - "Understanding WMS Offload Impact on Aruba Infrastructure" on page 23
  - "WMS Offload Details" on page 39

When to Use RTLS

- A hospital wants to achieve very precise location accuracy (5 -15 feet) for their medical devices which are associating to the WLAN.
- You want to locate items utilizing WiFi Tags.

NOTE

RTLS could negatively impact your AMP server's performance.

- See "Leveraging RTLS to Increase Accuracy" on page 41.

When to Define AMP as a Trap Host

- You want to track IDS events within the AMP UI.
- You are in the process of converting their older third-party WLAN devices to Aruba devices and want a unified IDS dashboard for all WLAN infrastructure.
- You want to relate Auth failures to a client device, AP, Group of APs, and controller. AMP provides this unique correlation capability.
- See "Define AMP as Trap Host using ArubaOS CLI" on page 20.

When to use Channel Utilization

- You have a minimum version of ArubaOS 6.1.0.0 and AP-105 or AP-135.

Prerequisites for Integration

If you have not discovered the Aruba infrastructure or configured credentials, refer to the previous chapters of this book:

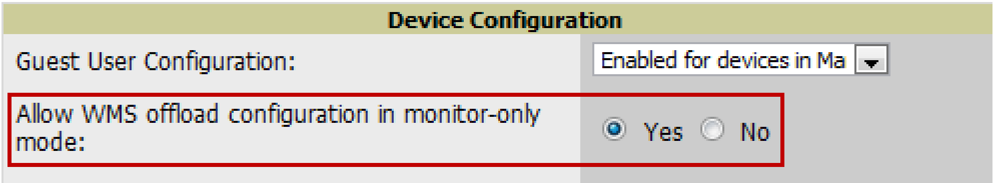
- Chapter 2, “Configuring AirWave for Aruba Infrastructure” on page 7
- Chapter 3, “Configuring an Aruba Group in AMP” on page 11
- Chapter 4, “” on page 13

Enable Stats Utilizing AMP

To enable stats on the Aruba controllers, follow these steps:

1. Navigate to **AMP Setup> General** and locate the **Device Configuration** section.
2. Set the **Allow WMS Offload Configuration in Monitor-Only Mode** field to **Yes**, as shown in Figure 9:

Figure 9 *WMS Offload Configuration in **AMP Setup > General***



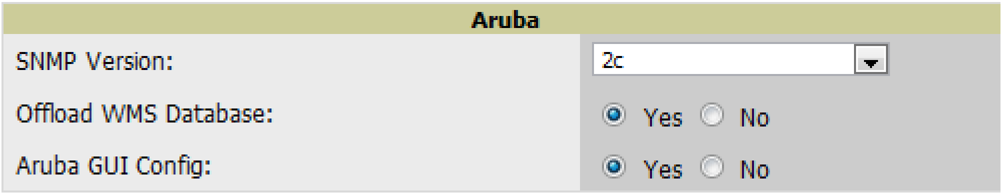
Device Configuration

Guest User Configuration: Enabled for devices in Ma

Allow WMS offload configuration in monitor-only mode: ● Yes ○ No

3. Navigate to **Groups > Basic** for the group that contains your Aruba controllers.
4. Locate the **Aruba** section on the page.
5. Set the **Offload WMS Database** field to **No,** as shown in Figure 10**:**

Figure 10 *Offload WMS Database field in **Groups > Basic***



Aruba

SNMP Version: 2c

Offload WMS Database: ● Yes ○ No

Aruba GUI Config: ● Yes ○ No

6. Select **Save and Apply**.
7. Select **Save**.

This will push a set of commands via SSH to all Aruba local controllers. AMP must have read/write access to the controllers in order to push these commands.

NOTE

This process will not reboot your controllers.

CAUTION

If you don't follow the above steps, local controllers will not be configured to populate statistics. This decreases AMP's capability to trend client signal information and to properly locate devices. See Appendix A, “ArubaOS and AMP CLI Commands” on page 33 **on how to utilize the ArubaOS CLI to enable stats on Aruba infrastructure.**

If your credentials are invalid or the changes are not applied to the controller, error messages will display on the controller's **APs/Devices > Monitor** page under the **Recent Events** section. If the change fails, AMP does not audit these setting (display mismatches) and you will need to apply to the controller by hand. See Appendix A, “ArubaOS and AMP CLI Commands” on page 33 for detailed instructions.

These are the commands pushed by AMP while enabling WMS Offload (do not enter these commands):

```
configure terminal
no mobility-manager <Active WMS IP Address>
wms
general collect-stats enable
stats-update-interval 120
show wms general
write mem
```

WMS Offload With AMP

To offload WMS on the Aruba controllers using AMP:

1. In **AMP Setup > General**, locate the **Device Configuration** section and enable or disable **Allow WMS Offload Configuration in Monitor-Only Mode.**
2. Select **Save and Apply**. This will push a set of commands via SSH to all Aruba master controllers. If the controller does not have an SNMPv3 user that matches the AMP database it will automatically create a new SNMPv3 user. AMP must have read/write access to the controllers in order to push these commands
3. Navigate to **Groups > Basic** and locate the **Aruba** section.
4. Set the **Offload WMS Database** field to **Yes**, as shown in Figure 10.

NOTE

This process will not reboot your controllers. See Appendix A, "ArubaOS and AMP CLI Commands" on page 33on how to utilize the ArubaOS CLI to enable stats or WMS Offload.

CAUTION

The SNMPv3 user's Auth Password and Privacy Password must be the same.

Do not enter these commands; these are pushed by AMP while enabling WMS Offload.

```
configure terminal
mobility-manager <AMP IP> user <AMP SNMPv3 User Name> <AMP Auth/Priv PW>
stats-update-interval 120
write mem
```

NOTE

AMP will configure SNMPv2 traps with the **mobile manager** command.

Define AMP as Trap Host using ArubaOS CLI

To ensure the AMP server is defined a trap host, access the command line interface of each controller (master and local), enter "enable" mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z

(Controller-Name) (config) # snmp-server host <AMP IP ADDR> version 2c <SNMP Community
String of Controller>
```

NOTE

Ensure the SNMP community matches those that were configured in Chapter 2, "Configuring AirWave for Aruba Infrastructure" .

```
(Controller-Name) (config) # snmp-server trap source <Controller-IP>
(Controller-Name) (config) # write mem
```

NOTE

AMP supports SNMP v2 traps and SNMP v3 informs in ArubaOS 3.4 and higher. SNMP v3 traps are not supported.

ArubaOS Traps Utilized by AMP.

The following are Auth, IDS, and ARM traps utilized by AMP:

- "Auth Traps" on page 21
- "IDS Traps" on page 21
- "ARM Traps" on page 22

Auth Traps

- wlsxNUserAuthenticationFailed
- wlsxNAuthServerReqTimedOut

IDS Traps

- wlsxwlsxSignatureMatchAP
- wlsxSignatureMatchSta
- wlsxSignAPNetstumbler
- wlsxSignStaNetstumbler
- wlsxSignAPAsleap
- wlsxSignStaAsleap
- wlsxSignAPAirjack
- wlsxSignStaAirjack
- wlsxSignAPNullProbeResp
- wlsxSignStaNullProbeResp
- wlsxSignAPDeauthBcast
- wlsxSignStaDeauthBcastwlsxChannelFrameErrorRateExceeded
- wlsxChannelFrameFragmentationRateExceeded
- wlsxChannelFrameRetryRateExceeded
- wlsxNIpSpoofingDetected
- wlsxStaImpersonation
- wlsxReservedChannelViolation
- wlsxValidSSIDViolation
- wlsxStaPolicyViolation
- wlsxRepeatWEPIVViolation
- wlsxWeakWEPIVViolation
- wlsxFrameRetryRateExceeded
- wlsxFrameReceiveErrorRateExceeded
- wlsxFrameFragmentationRateExceeded
- wlsxFrameBandWidthRateExceeded
- wlsxFrameLowSpeedRateExceeded
- wlsxFrameNonUnicastRateExceeded
- wlsxChannelRateAnomaly

- wlsxNodeRateAnomalyAP
- wlsxNodeRateAnomalySta
- wlsxEAPRateAnomaly
- wlsxSignalAnomaly
- wlsxSequenceNumberAnomalyAP
- wlsxSequenceNumberAnomalySta
- wlsxApFloodAttack
- wlsxInvalidMacOUIAP
- wlsxInvalidMacOUISta
- wlsxStaRepeatWEPIVViolation
- wlsxStaWeakWEPIVViolation
- wlsxStaAssociatedToUnsecureAP
- wlsxStaUnAssociatedFromUnsecureAP
- wlsxAPImpersonation
- wlsxDisconnectStationAttackAP
- wlsxDisconnectStationAttackSta

ARM Traps

- AP Power Change
- AP Mode Change
- AP Channel Change

Ensuring That IDS And Auth Traps Display in AMP

Validate your ArubaOS configuration by exiting the configure terminal mode and issue the following command:

```
(Controller-Name) # show snmp trap-list
```

If any of the traps in the output of this command do not appear to be enabled enter **`configure terminal`** mode and issue the following command:

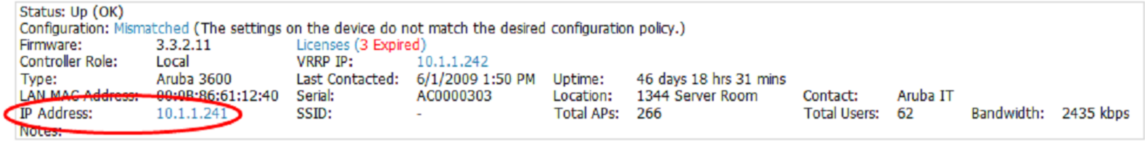
```
(Controller-Name) (config) # snmp-server trap enable <TRAPS FROM LIST ABOVE>
(Controller-Name) (config) # write mem
```

NOTE

See Appendix A, "ArubaOS and AMP CLI Commands" on page 33 for the full command that can be copied and pasted directly into the ArubaOS CLI.

Ensure the source IP of the traps match the IP that AMP utilizes to manage the controller, as shown in Figure 11. Navigate to **APs/Devices > Monitor** to validate the IP address in the **Device Info** section.

Figure 11 *Verify IP Address on **APs/Devices > Monitor** Page*



Status: Up (OK)
Configuration: Mismatched (The settings on the device do not match the desired configuration policy.)
Firmware: 3.3.2.11
Licenses (3 Expired)
Controller Role: Local
VRRP IP: 10.1.1.242
Type: Aruba 3600
Last Contacted: 6/1/2009 1:50 PM
Uptime: 46 days 18 hrs 31 mins
LAN MAC Address: 00:0B:86:61:12:40
Serial: AC0000303
Location: 1344 Server Room
Contact: Aruba IT
IP Address: 10.1.1.241
SSID: -
Total APs: 266
Total Users: 62
Bandwidth: 2435 kbps
Notes:

Verify that there is a SNMPv2 community string that matches the SNMP Trap community string on the controller.

```
(Controller-Name) # show snmp community
SNMP COMMUNITIES
----------------
COMMUNITY ACCESS     VERSION
--------- ------     -------
public    READ_ONLY V1, V2c

(Controller-Name) # #show snmp trap-host

SNMP TRAP HOSTS
---------------
HOST          VERSION    SECURITY NAME PORT   TYPE TIMEOUT RETRY
----          -------    ------------- ----   ---- ------- -----
10.2.32.4     SNMPv2c    public         162    Trap N/A      N/A
```

Verify firewall port **162** (default) is **open** between AMP and the controller.

Validate traps are making it into AMP by issuing the following commands from AMP command line.

```
[root@AMP ~]# qlog enable snmp_traps

[root@AMP ~]# tail -f /var/log/amp_diag/snmp_traps

1241627740.392536 handle_trap|2009-05-06 09:35:40 UDP: [10.2.32.65]->[10.51.5.118]:-
32737 sends trap: DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (127227800) 14 days,
17:24:38.00 SNMPv2-MIB::snmpTrapOID.0 = OID: SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.2.1106 SNMPv2-SMI::enterprises.14823.2.3.1.11.1.1.60
= Hex-STRING: 07 D9 05 06 09 16 0F 00 2D 08 00    SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.5.0 = Hex-STRING: 00 1A 1E 6F 82 D0 SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.6.0 = STRING: aruba-apSNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.1.0 = Hex-STRING: 00 1A 1E C0 2B 32 SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.56.0 = INTEGER: 2    SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.17.0 = STRING: aruba-124-c0:2b:32 SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.18.0 = INTEGER: 11   SNMPv2-
SMI::enterprises.14823.2.3.1.11.1.1.58.0 = STRING: http://10.51.5.118/screens/wmsi/
reports.html?mode=ap&bssid=00:1a:1e:6f:82:d0
```

NOTE

You will see many IDS and Auth Traps from this command. AMP only processes a small subset of these traps which display within AMP. The traps that AMP does process are listed above.

Ensure you disable qlogging after testing as it could negatively impact AMP performance if left turned on:

```
[root@AMP ~]# qlog enable snmp_traps
```

Understanding WMS Offload Impact on Aruba Infrastructure

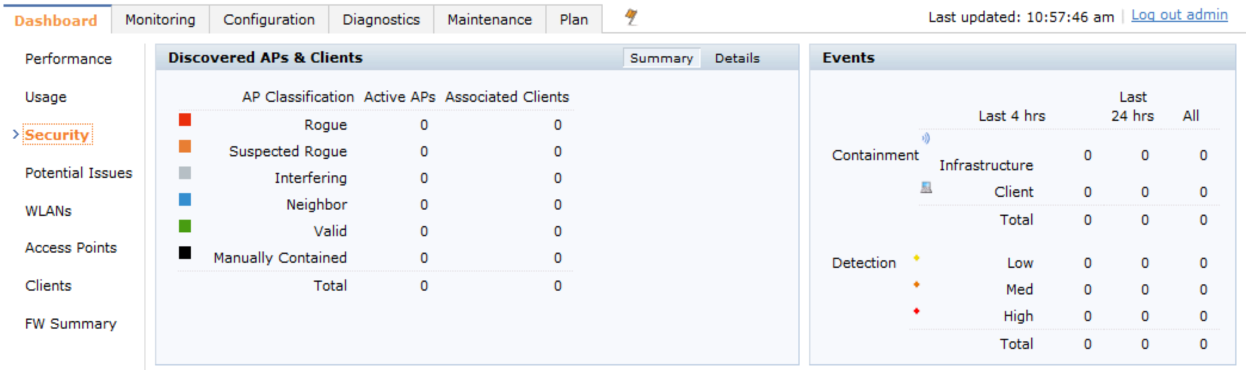
When offloading WMS, it is important to understand what functionality is migrated to AMP and what functionality is deprecated.

The following ArubaOS tabs and sections are deprecated after offloading WMS:

- **Plan -** The tab where floor plans are stored and heatmaps are generated. Prior to offloading WMS, ensure that you have exported floor plans from ArubaOS and imported them into AMP. All functionality within the Plan Tab is incorporated with the VisualRF module in AMP.
- **Dashboard>Security Summary** - The **Security Summary** section (Figure 12) disappears after offloading WMS. The data is still being processed by the master controller, but the summary information is not available. You must use AMP to view data for APs, clients and events in detail and summary from.

- AMP displays information on Rogue APs in the **RAPIDS > Overview** pages.
- Information on Suspected Rogue, Interfering and known interfering APs is available in AMP on each **APs/Devices > Manage** page.
- IDS events data and reports appear on AMP's **Reports > Generated > IDS Events** page.

Figure 12 *Security Summary on Master Controller*



	AP Classification	Active APs	Associated Clients
🟥	Rogue	0	0
🟧	Suspected Rogue	0	0
⬜	Interfering	0	0
🟦	Neighbor	0	0
🟩	Valid	0	0
⬛	Manually Contained	0	0
	Total	0	0

		Last 4 hrs	Last 24 hrs	All
Containment	Infrastructure	0	0	0
	Client	0	0	0
	Total	0	0	0
Detection	Low	0	0	0
	Med	0	0	0
	High	0	0	0
	Total	0	0	0

See "Rogue Device Classification" on page 29 for more information on security, IDS, WIPS, WIDS, classification, and RAPIDS.

Chapter 6

Aruba-Specific Capabilities in AMP

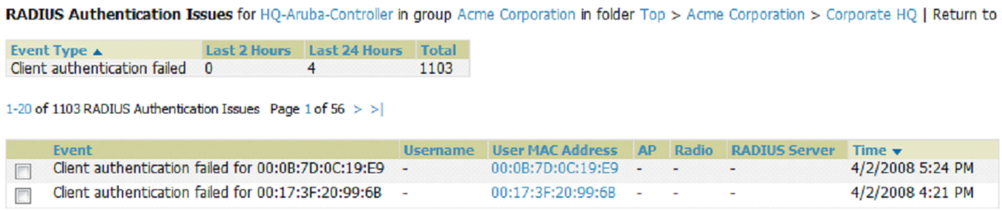
This chapter discusses Aruba-specific capabilities in AMP, and contains the following topics:

- "Aruba Traps for RADIUS Auth And IDS Tracking" on page 25
- "Remote AP Monitoring" on page 26
- "ARM And Channel Utilization Information" on page 26
- "Viewing Controller License Information" on page 28
- "Rogue Device Classification" on page 29
- "Rules-Based Controllers Classification" on page 30

Aruba Traps for RADIUS Auth And IDS Tracking

The authentication failure traps are received by the AMP server and correlated to the proper controller, AP, and user. See Figure 13 showing all authentication failures related to a controller.

Figure 13 *RADIUS Authentication Traps in AMP*



RADIUS Authentication Issues for HQ-Aruba-Controller in group Acme Corporation in folder Top > Acme Corporation > Corporate HQ | Return to AP/Device Monitor page

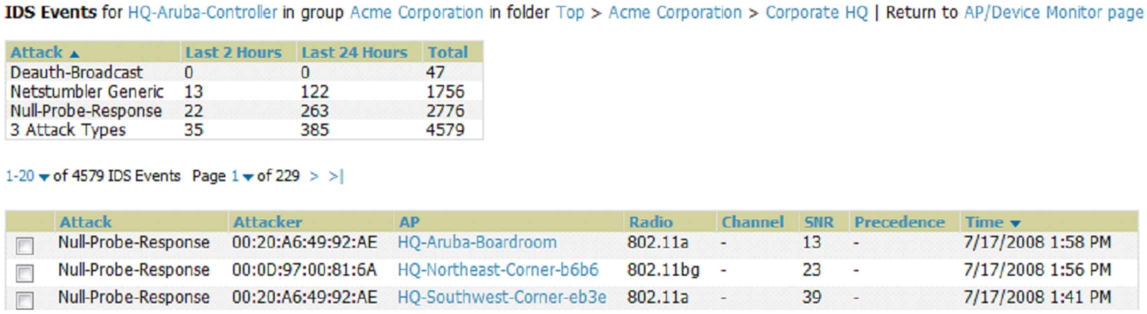
Event Type ▲	Last 2 Hours	Last 24 Hours	Total
Client authentication failed	0	4	1103

1-20 of 1103 RADIUS Authentication Issues Page 1 of 56 > >|

	Event	Username	User MAC Address	AP	Radio	RADIUS Server	Time ▼
☐	Client authentication failed for 00:0B:7D:0C:19:E9	-	00:0B:7D:0C:19:E9	-	-	-	4/2/2008 5:24 PM
☐	Client authentication failed for 00:17:3F:20:99:6B	-	00:17:3F:20:99:6B	-	-	-	4/2/2008 4:21 PM

The IDS traps are received by the AMP server and correlated to the proper controller, AP, and user. See Figure 14 showing all IDS traps related to a controller.

Figure 14 *IDS Traps in AMP*



IDS Events for HQ-Aruba-Controller in group Acme Corporation in folder Top > Acme Corporation > Corporate HQ | Return to AP/Device Monitor page

Attack ▲	Last 2 Hours	Last 24 Hours	Total
Deauth-Broadcast	0	0	47
Netstumbler Generic	13	122	1756
Null-Probe-Response	22	263	2776
3 Attack Types	35	385	4579

1-20 ▼ of 4579 IDS Events Page 1 ▼ of 229 > >|

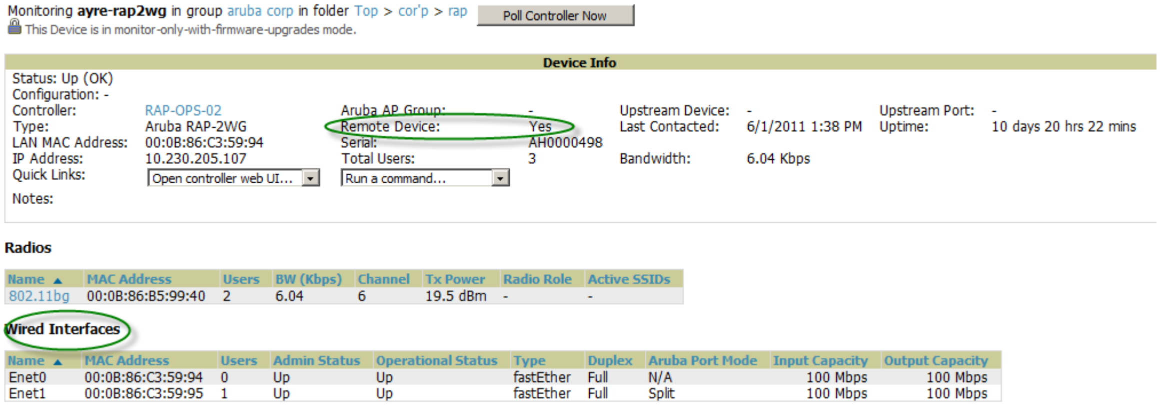
	Attack	Attacker	AP	Radio	Channel	SNR	Precedence	Time ▼
☐	Null-Probe-Response	00:20:A6:49:92:AE	HQ-Aruba-Boardroom	802.11a	-	13	-	7/17/2008 1:58 PM
☐	Null-Probe-Response	00:0D:97:00:81:6A	HQ-Northeast-Corner-b6b6	802.11bg	-	23	-	7/17/2008 1:56 PM
☐	Null-Probe-Response	00:20:A6:49:92:AE	HQ-Southwest-Corner-eb3e	802.11a	-	39	-	7/17/2008 1:41 PM

Remote AP Monitoring

To monitor remote APs, follow these steps:

1. From the **APs/Devices > List** page, filter on the **Remote Device** column to find remote devices.
2. To view detailed information on the remote device, select the device name. The page illustrated in Figure 15 appears.

Figure 15 *Remote AP Detail Page*



Monitoring **ayre-rap2wg** in group aruba corp in folder Top > cor'p > rap

This Device is in monitor-only-with-firmware-upgrades mode.

Device Info

Status: Up (OK)
Configuration: -

Controller:	RAP-OPS-02	Aruba AP Group:	-	Upstream Device:	-	Upstream Port:	-
Type:	Aruba RAP-2WG	Remote Device:	Yes	Last Contacted:	6/1/2011 1:38 PM	Uptime:	10 days 20 hrs 22 mins
LAN MAC Address:	00:0B:86:C3:59:94	Serial:	AH0000498				
IP Address:	10.230.205.107	Total Users:	3	Bandwidth:	6.04 Kbps		
Quick Links:	Open controller web UI...	Run a command...					

Notes:

Radios

Name ▲	MAC Address	Users	BW (Kbps)	Channel	Tx Power	Radio Role	Active SSIDs
802.11bg	00:0B:86:B5:99:40	2	6.04	6	19.5 dBm	-	-

Wired Interfaces

Name ▲	MAC Address	Users	Admin Status	Operational Status	Type	Duplex	Aruba Port Mode	Input Capacity	Output Capacity
Enet0	00:0B:86:C3:59:94	0	Up	Up	fastEther	Full	N/A	100 Mbps	100 Mbps
Enet1	00:0B:86:C3:59:95	1	Up	Up	fastEther	Full	Split	100 Mbps	100 Mbps

3. You can also see if there are users plugged into the wired interfaces in the Connected Users list.

NOTE

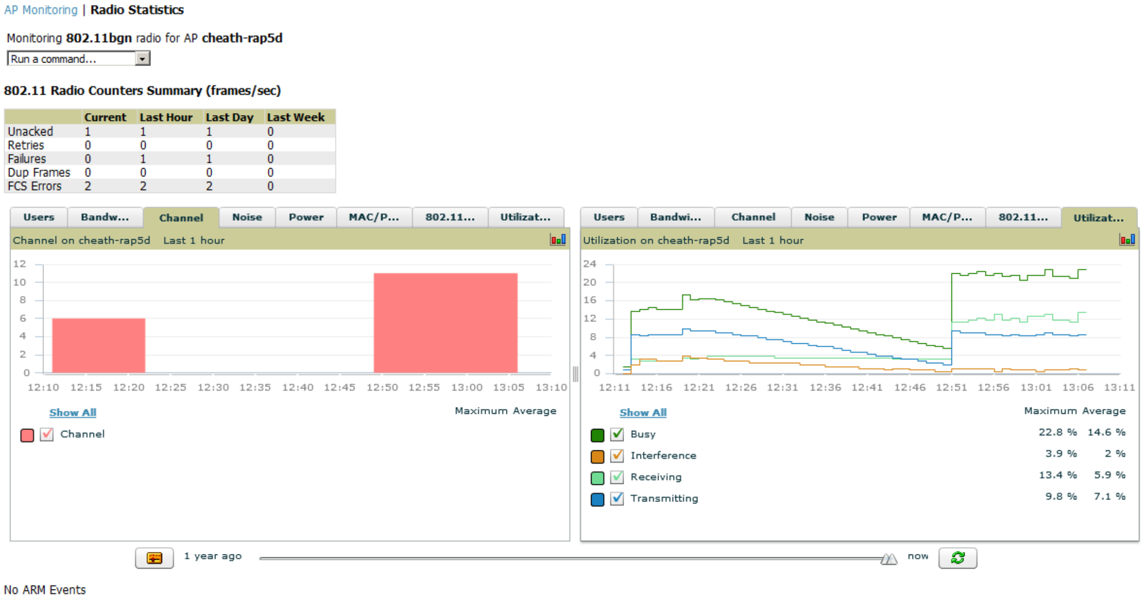
This feature is only available when the remote APs are in split tunnel and tunnel modes.

ARM And Channel Utilization Information

ARM statistics And Channel utilization are very powerful tools for diagnosing capacity and other issues in your WLAN.

1. Navigate to an **APs/Devices > Monitor** page for any of the following Aruba models: AP-105, AP-92, AP-93, AP-124, AP-125, or AP-135.
2. In the **Radios** table, select a radio link under the **Name** column for a radio.

Figure 16 *ARM and Channel Utilization Graphs*



AP Monitoring | **Radio Statistics**

Monitoring **802.11bgn** radio for AP **cheath-rap5d**

802.11 Radio Counters Summary (frames/sec)

	Current	Last Hour	Last Day	Last Week
Unacked	1	1	1	0
Retries	0	0	0	0
Failures	0	1	1	0
Dup Frames	0	0	0	0
FCS Errors	2	2	2	0

	Maximum	Average
☑ Busy	22.8 %	14.6 %
☑ Interference	3.9 %	2 %
☑ Receiving	13.4 %	5.9 %
☑ Transmitting	9.8 %	7.1 %

No ARM Events

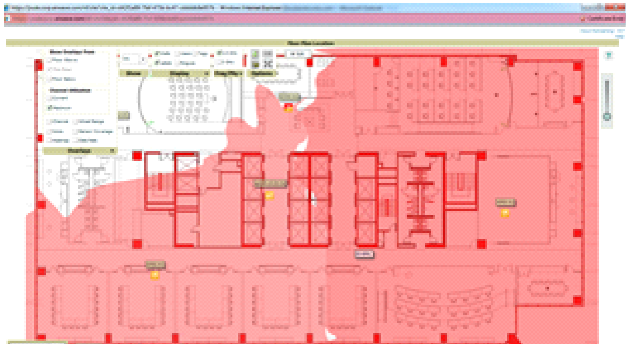
See the *AirWave Management Platform 7.2 User Guide* in **Home > Documentation** for more information on the data displayed in the **Radio Statistics** page for these devices.

VisualRF and Channel Utilization

To view how channel utilization is impacting an area within a building, follow these steps:

1. Navigate to a floor plan by clicking on the thumbnail on a device's **APs/Devices > Monitor** page or navigating to **VisualRF > Floor Plans** page.
2. Select the **Overlays** menu.
3. Select **Utilization** overlay.
4. Select **Current** or **Maximum** (over last 24 hours).
5. Select total (default), receive, transmit, or interference (see Figure 17).

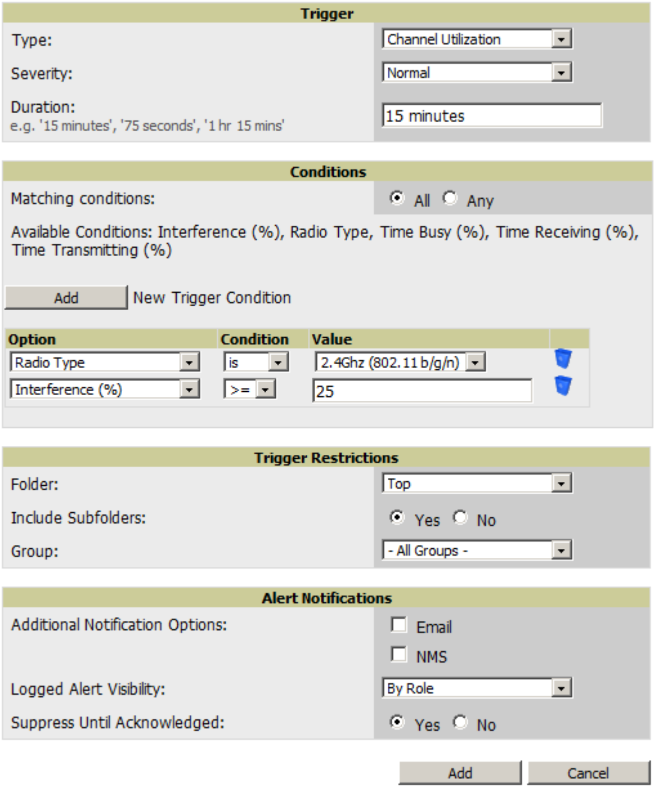
Figure 17 *Channel Utilization in VisualRF (Interference)*



Configuring Channel Utilization Triggers

1. Navigate to **System > Triggers** and select **Add**.
2. Select **Channel Utilization** from the **Type** drop-down menu as seen on Figure 18:

Figure 18 *Channel Utilization Trigger*



Trigger

Type: Channel Utilization

Severity: Normal

Duration: 15 minutes
e.g. '15 minutes', '75 seconds', '1 hr 15 mins'

Conditions

Matching conditions: ● All ○ Any

Available Conditions: Interference (%), Radio Type, Time Busy (%), Time Receiving (%), Time Transmitting (%)

Add New Trigger Condition

Option	Condition	Value
Radio Type	is	2.4Ghz (802.11 b/g/n)
Interference (%)	>=	25

Trigger Restrictions

Folder: Top

Include Subfolders: ● Yes ○ No

Group: - All Groups -

Alert Notifications

Additional Notification Options: ☐ Email ☐ NMS

Logged Alert Visibility: By Role

Suppress Until Acknowledged: ● Yes ○ No

3. Enter the duration evaluation period.
4. Select **Add New Trigger Condition**.
5. Create a trigger condition for **Radio Type** and select the frequency to evaluate.
6. Select total, receive, transmit, or interference trigger condition.
7. Set up any restrictions or notifications (refer to the *AirWave Management Platform 7.2 User Guide* in **Home > Documentation** for more details)
8. When finished, select **Add**.

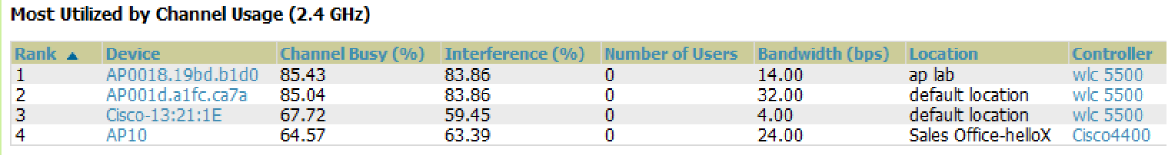
Viewing Channel Utilization Alerts

1. Navigate to **APs/Devices > Monitor** or **System > Alerts**.
2. Sort the **Trigger Type** column and find **Channel Utilization** alerts.

View Channel Utilization in RF Health Reports

1. Navigate to **Reports > Generated**.
2. Find and select a Device Summary or RF Health report.

Figure 19 *Channel Utilization in an RF Health Report*



Most Utilized by Channel Usage (2.4 GHz)

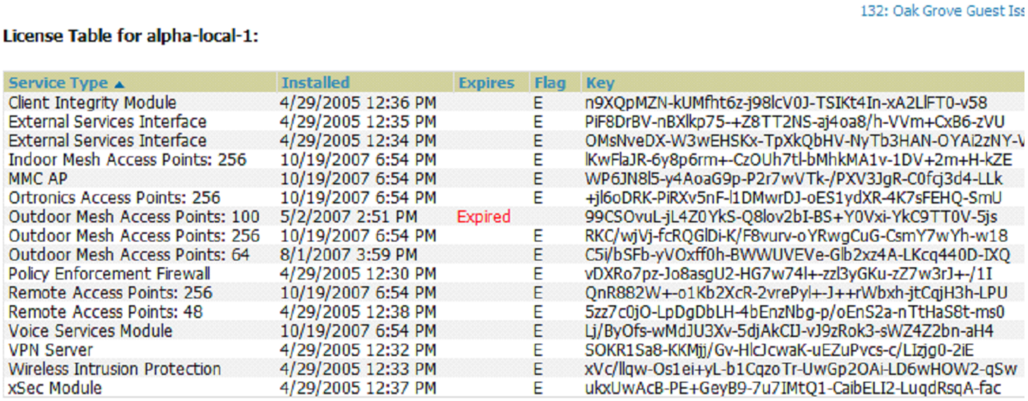
Rank ▲	Device	Channel Busy (%)	Interference (%)	Number of Users	Bandwidth (bps)	Location	Controller
1	AP0018.19bd.b1d0	85.43	83.86	0	14.00	ap lab	wlc 5500
2	AP001d.a1fc.ca7a	85.04	83.86	0	32.00	default location	wlc 5500
3	Cisco-13:21:1E	67.72	59.45	0	4.00	default location	wlc 5500
4	AP10	64.57	63.39	0	24.00	Sales Office-helloX	Cisco4400

Viewing Controller License Information

Follow these steps to view your controller's license information in AMP:

1. Navigate to the **APs/Devices > Monitor** page of a controller under AMP management.
2. Select the **License** link in the **Device Info** section. A pop-up window appears listing all licenses.

Figure 20 *License Popup from **APs/Devices > Monitor***



132: Oak Grove Guest Is

License Table for alpha-local-1:

Service Type ▲	Installed	Expires	Flag	Key
Client Integrity Module	4/29/2005 12:36 PM		E	n9XQpMZN-kUMfht6z-j98lcV0J-TSIKt4In-xA2LlFT0-v58
External Services Interface	4/29/2005 12:35 PM		E	PiF8DrBV-nBXlkp75-+Z8TT2NS-aj4oa8/h-VVm+CxB6-zVU
External Services Interface	4/29/2005 12:34 PM		E	OMsNveDX-W3wEHSKx-TpXkQbHV-NyTb3HAN-OYAi2zNY-
Indoor Mesh Access Points: 256	10/19/2007 6:54 PM		E	lKwFlaJR-6y8p6rm+-CzOUh7tl-bMhkMA1v-1DV+2m+H-kZE
MMC AP	10/19/2007 6:54 PM		E	WP6JN8l5-y4AoaG9p-P2r7wVTk-/PXV3JgR-C0fcj3d4-LLk
Ortronics Access Points: 256	10/19/2007 6:54 PM		E	+jl6oDRK-PiRXv5nF-l1DMwrDJ-oES1ydXR-4K7sFEHQ-SmU
Outdoor Mesh Access Points: 100	5/2/2007 2:51 PM	Expired		99CSOvuL-jL4Z0YkS-Q8lov2bI-BS+Y0Vxi-YkC9TT0V-5js
Outdoor Mesh Access Points: 256	10/19/2007 6:54 PM		E	RKC/wjVj-fcRQGlDi-K/F8vurv-oYRwgCuG-CsmY7wYh-w18
Outdoor Mesh Access Points: 64	8/1/2007 3:59 PM		E	C5i/bSFb-yVOxff0h-BWWUVEVe-Glb2xz4A-LKcq440D-IXQ
Policy Enforcement Firewall	4/29/2005 12:30 PM		E	vDXRo7pz-Jo8asgU2-HG7w74l+-zzl3yGKu-zZ7w3rJ+-/1I
Remote Access Points: 256	10/19/2007 6:54 PM		E	QnR882W+-o1Kb2XcR-2vrePyl+-J++rWbxh-jtCqjH3h-LPU
Remote Access Points: 48	4/29/2005 12:38 PM		E	5zz7c0jO-LpDgDbLH-4bEnzNbg-p/oEnS2a-nTtHaS8t-ms0
Voice Services Module	10/19/2007 6:54 PM		E	Lj/ByOfs-wMdJU3Xv-5djAkCIJ-vJ9zRok3-sWZ4Z2bn-aH4
VPN Server	4/29/2005 12:32 PM		E	SOKR1Sa8-KKMjj/Gv-HlcJcwaK-uEZuPvcs-c/LIzjg0-2iE
Wireless Intrusion Protection	4/29/2005 12:33 PM		E	xVc/llqw-Os1ei+yL-b1CqzoTr-UwGp2OAi-LD6wHOW2-qSw
xSec Module	4/29/2005 12:37 PM		E	ukxUwAcB-PE+GeyB9-7u7IMtQ1-CaibELI2-LuqdRsqA-fac

Rogue Device Classification

Only complete this section if you have completed WMS Offload procedure above. After offloading WMS, AMP maintains the primary ARM, WIPS, and WIDS state classification for all devices discovered over-the-air.

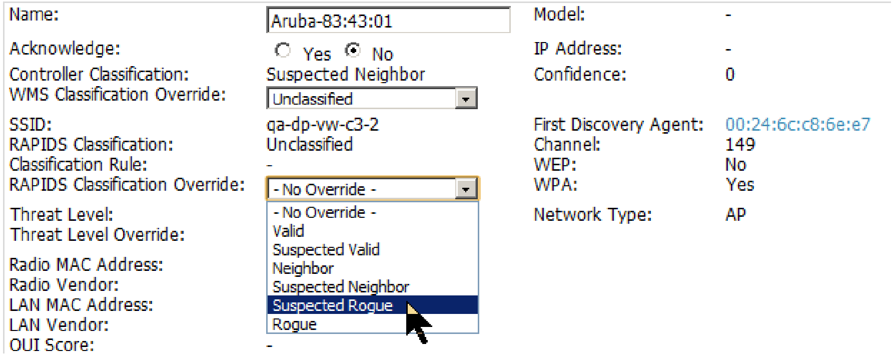
Table 5 *WIPS/WIDS to AMP Controller Classification Matrix*

AMP Controller Classification	ArubaOS (WIPS/WIDS)
Unclassified (default state)	Unknown
Valid	Valid
Suspected Neighbor	Interfering
Neighbor	Known Interfering
Suspected Rogue	Suspected Rogue
Rogue	Rogue
Contained Rogue	DOS

To check and reclassify rogue devices, follow these steps:

1. Navigate to the **Rogue > Detail** page for the rogue device, as shown in Figure 21.

Figure 21 *Rogue Detail Page Illustration*



Name: Aruba-83:43:01
Acknowledge: ○ Yes ● No
Controller Classification: Suspected Neighbor
WMS Classification Override: Unclassified
SSID: qa-dp-vw-c3-2
RAPIDS Classification: Unclassified
Classification Rule: -
RAPIDS Classification Override: - No Override -
Threat Level:
Threat Level Override:
Radio MAC Address:
Radio Vendor:
LAN MAC Address:
LAN Vendor:
OUI Score: -

Model: -
IP Address: -
Confidence: 0
First Discovery Agent: 00:24:6c:c8:6e:e7
Channel: 149
WEP: No
WPA: Yes
Network Type: AP

2. Select the proper classification from the **RAPIDS Classification Override** drop-down menu.

CAUTION

Caution: Changing the controller's classification within the AMP UI will push a reclassification message to all controllers managed by the AMP server that are in Groups with Offloading the WMS database set to Yes. To reset the controller classification of a rogue device on AMP, change the controller classification on the AMP UI to unclassified.

Controller classification can also be updated from **RAPIDS > List** via the **Modify Devices** link.

All rogue devices will be set to a default controller classification of unclassified when WMS is first offloaded except for devices classified as valid. Rogue devices classified in AOS as valid will also be classified within AMP as valid for their controller classification as well. As APs report subsequent classification information about rogues, this classification will be reflected within AMP UI and propagated to controllers that AMP manages. The device classification reflected in the controller's UI and in the AMP UI will probably not match, because the controller/APs do not reclassify rogue devices frequently.

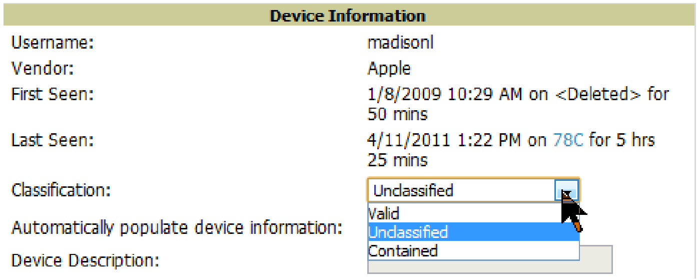
To update a group of devices' controller classification to match the AOS device classification, navigate to **RAPIDS > List** and utilize the **Modify Devices** checkbox combined with the multiple sorting a filtering features.

Table 6 *ARM to AMP Classification Matrix*

AMP	AOS (ARM)
Unclassified (default state)	Unknown
Valid	Valid
Contained	DOS

1. Navigate to the **Users > User Detail** page for the user.
2. Select the proper classification from the **Classification** drop-down menu as seen in Figure 22:

Figure 22 *User Classification*



Device Information

Username: madisonl

Vendor: Apple

First Seen: 1/8/2009 10:29 AM on <Deleted> for 50 mins

Last Seen: 4/11/2011 1:22 PM on 78C for 5 hrs 25 mins

Classification: Unclassified

Automatically populate device information:

Device Description:

CAUTION

Caution: Changing User Classification within the AMP UI will push a user reclassification message to all controllers managed by the AMP server that are in Groups with Offloading the WMS database set to Yes.

All users will be set to a default classification of unclassified when wms is first offloaded. As APs report subsequent classification information about users, this classification will be reflected within AMP UI and propagated to controllers that AMP manages.   It is probable that the user's classification reflected in the controller's UI and in the AMP UI will not match, because the controller/APs do not reclassify users frequently.

There is no method in the AMP UI to update user classification on mass to match the controller's classification. Each client must be updated individually within the AMP UI.

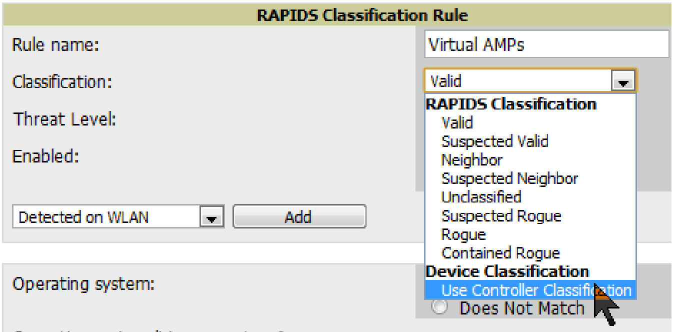
Rules-Based Controllers Classification

Using RAPIDS Defaults for Controllers Classification

To use the controller's classification as RAPIDS classification, follow these steps:

1. Navigate to **RAPIDS > Rules** and select the pencil icon for a rule.
2. In the **Classification** drop-down menu, select **Use Controllers Classification** as seen in Figure 23.
3. Select **Save**.

Figure 23 *Using Controller Classification*



RAPIDS Classification Rule

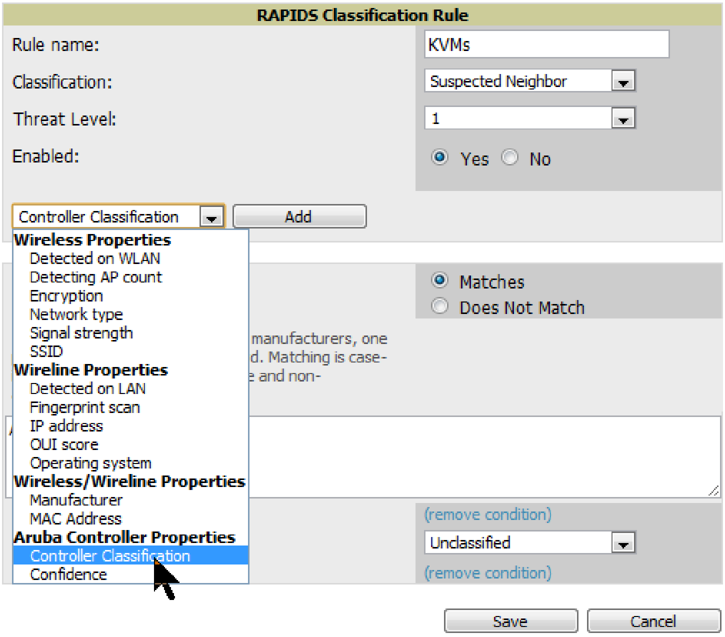
Rule name: Virtual AMPs

Classification: Valid

Changing RAPIDS based on Controller Classification

1. Navigate to **RAPIDS > Rules**.
2. In the **Classification** drop-down menu, select desired RAPIDS classification.
3. Select **Controller Classification** from drop-down menu, as shown in Figure 24.

Figure 24 *Configure Rules for Classification*



RAPIDS Classification Rule

Rule name: KVMs

Classification: Suspected Neighbor

Threat Level: 1

Enabled: ● Yes ○ No

Controller Classification

● Matches ○ Does Not Match

Unclassified

4. Select **Add**.
5. Select desired controller classification to use as an evaluation in RAPIDS.
6. Select **Save**.

Appendix A

ArubaOS and AMP CLI Commands

Enable Channel Utilization Events

CAUTION

Caution: Enabling these commands on ArubaOS versions prior to 6.1 can result in performance issues on the controller.

To enable channel utilization events utilizing the ArubaOS CLI, use SSH to access a local or master controller's command-line interface, enter **enable** mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z

(Controller-Name) (config) # mgmt-server type amp primary-server <AMP IP>
(Controller-Name) (config) # write mem
```

Enable Stats With the ArubaOS CLI

The following commands enable collection of statistics (up to 25,000 entries) on the master controller for monitored APs and clients.

NOTE

Do not use these commands if you use the AMP GUI to monitor APs and Clients. Enabling these commands on ArubaOS versions prior to 6.1 can result in performance issues on the controller.

Use SSH to access the master controller's command-line interface, enter **enable** mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z

(Controller-Name) (config) # wms general collect-stats enable
(Controller-Name) (config) # write mem
```

Offload WMS Using the ArubaOS or AMP CLI

NOTE

Do not use these commands if you use the AMP GUI to monitor APs and clients.

Use the following commands to offload WMS using the ArubaOS command-line interface or the AMP SNMP Walk.

ArubaOS CLI

SSH into all controllers (local and master), and enter “enable” mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z
(Controller-Name) (config) # mobility-manager <AMP IP> user <MMS-USER> <MMS-SNMP-
PASSWORD> trap-version 2c
(Controller-Name) (config) # write mem
```

This command creates the AMP server as an SNMPv3 Trap Host in the controller's running configuration. This command also creates an SNMPv3 user on the controller with authentication protocol configured to **SHA** and privacy protocol **DES**. The user and password must be at least eight characters, because the Net-SNMP package in AMP adheres to this IETF recommendation. ArubaOS automatically creates Auth and Privacy passwords from this single password. If mobility-manager is already using a preconfigured SNMPv3 user, ensure the privacy and authentication passwords are the same.

Example:

```
mobility-manager 10.2.32.1 user airwave123 airwave123
```

AMP SNMP

Log in into the AMP server with proper administrative access and issue the following command for all controllers (master and locals):

```
[root@AMP ~]# snmpwalk -v3 -a SHA -l AuthPriv -u <MMS-USER> -A <MMS-SNMP-PASSWORD> -X
<MMS-SNMP-PASSWORD> <Controller-IP> wlsxSystemExtGroup

WLSX-SYSTEMEXT-MIB::wlsxSysExtSwitchIp.0 = IpAddress: 10.51.5.222
WLSX-SYSTEMEXT-MIB::wlsxSysExtHostname.0 = STRING: aruba-3600-2
.
..
WLSX-SYSTEMEXT-MIB::wlsxSysExtSwitchLastReload.0 = STRING: User reboot.
WLSX-SYSTEMEXT-MIB::wlsxSysExtLastStatsReset.0 = Timeticks: (0) 0:00:00.00 response
[root@AMP ~]#
```

Unless this SNMP walk command is issued properly on all of the controllers, they will not properly populate client and rogue statistics. Ensure the user and passwords match exactly to those entered in above sections.

Example:

```
snmpwalk -v3 -a SHA -l AuthPriv -u airwave123 -A airwave123 -X airwave123 10.51.3.222
wlsxSystemExtGroup
```

If you do not use the AMP WebUI to offload WMS, you must add a cronjob on the AMP server to ensure continued statistical population. Because the MIB walk/touch does not persist through a controller reboot, a cronjob is required to continually walk and touch the MIB.

Pushing Configs from Master to Local Controllers

Use the following ArubaOS CLI commands to ensure that the master controller is properly pushing configuration settings from the master controller to local controllers. This command ensures configuration changes made on the master controller will propagate to all local controllers.

NOTE

Do not use these commands if you use the AMP GUI to monitor APs and clients.

```
(Controller-Name) (config) # cfgm mms config disable
(Controller-Name) (config) # write mem
```

Disable Debugging Utilizing ArubaOS CLI

If you are experiencing performance issues on the master controller, ensure that debugging is disabled. It should be disabled by default. Debugging coupled with gathering the enhanced statistics can put a strain on the controllers CPU, so it is highly recommended to disable debugging.

To disable debugging, SSH into the controller, enter "enable" mode, and issue the following commands:

```
(Controller-Name) # show running-config | include logging level debugging
```

If there is output, then use the following commands to remove the debugging:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z

(Controller-Name) (config) # no logging level debugging <module from above>
(Controller-Name) (config) # write mem
```

Restart WMS on Local Controllers

To ensure local controllers are populating rogue information properly, use SSH to access the command-line interface of each local controller, enter enable mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z
(Controller-Name) (config) # process restart wms
```

After executing the **restart WMS** command in ArubaOS, you will need to wait until the next Rogue Poll Period on the AMP and execute a **Poll Now** operation for each local controller on the **APs/Devices** > **List page** before rogue devices begin to appear in AMP.

Configure ArubaOS CLI when not Offloading WMS

To ensure proper event correlation for IDS events when WMS is not offloaded to AMP, access the command line interface of each controller (master and local), enter "enable" mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z
(Controller-Name) (config) # ids management-profile
(Controller-Name) (config) # ids general-profile <name>
(Controller-Name) (config) # ids-events logs-and-traps
(Controller-Name) (config) # write mem
```

Copy And Paste to Enable Proper Traps With the ArubaOS CLI

To ensure the proper traps are configured on Aruba controllers, copy and paste the following command in config mode:

```
snmp-server trap enable wlsxNUserAuthenticationFailed
snmp-server trap enable wlsxUserAuthenticationFailed
snmp-server trap enable wlsxNAuthServerReqTimedOut
snmp-server trap enable wlsxSignatureMatchAP
snmp-server trap enable wlsxSignatureMatchSta
snmp-server trap enable wlsxSignAPNetstumbler
snmp-server trap enable wlsxSignStaNetstumbler
snmp-server trap enable wlsxSignAPAsleap
snmp-server trap enable wlsxSignStaAsleap
snmp-server trap enable wlsxSignAPAirjack
snmp-server trap enable wlsxSignStaAirjack
snmp-server trap enable wlsxSignAPNullProbeResp
snmp-server trap enable wlsxSignStaNullProbeResp
snmp-server trap enable wlsxSignAPDeauthBcast
snmp-server trap enable wlsxSignStaDeauthBcastwlsxChannelFrameErrorRateExceeded
snmp-server trap enable wlsxChannelFrameFragmentationRateExceeded
snmp-server trap enable wlsxChannelFrameRetryRateExceeded
snmp-server trap enable wlsxNIpSpoofingDetected
snmp-server trap enable wlsxStaImpersonation
snmp-server trap enable wlsxReservedChannelViolation
snmp-server trap enable wlsxValidSSIDViolation
snmp-server trap enable wlsxStaPolicyViolation
snmp-server trap enable wlsxRepeatWEPIVViolation
snmp-server trap enable wlsxWeakWEPIVViolation
snmp-server trap enable wlsxFrameRetryRateExceeded
snmp-server trap enable wlsxFrameReceiveErrorRateExceeded
snmp-server trap enable wlsxFrameFragmentationRateExceeded
snmp-server trap enable wlsxFrameBandWidthRateExceeded
snmp-server trap enable wlsxFrameLowSpeedRateExceeded
snmp-server trap enable wlsxFrameNonUnicastRateExceeded
snmp-server trap enable wlsxChannelRateAnomaly
snmp-server trap enable wlsxNodeRateAnomalyAP
snmp-server trap enable wlsxNodeRateAnomalySta
snmp-server trap enable wlsxEAPRateAnomaly
snmp-server trap enable wlsxSignalAnomaly
snmp-server trap enable wlsxSequenceNumberAnomalyAP
snmp-server trap enable wlsxSequenceNumberAnomalySta
snmp-server trap enable wlsxApFloodAttack
snmp-server trap enable wlsxInvalidMacOUIAP
snmp-server trap enable wlsxInvalidMacOUISta
snmp-server trap enable wlsxStaRepeatWEPIVViolation
snmp-server trap enable wlsxStaWeakWEPIVViolation
snmp-server trap enable wlsxStaAssociatedToUnsecureAP
snmp-server trap enable wlsxStaUnAssociatedFromUnsecureAP
snmp-server trap enable wlsxAPImpersonation
snmp-server trap enable wlsxDisconnectStationAttackAP
snmp-server trap enable wlsxDisconnectStationAttackSta
```

NOTE

You will need to issue the `write mem` command.

Appendix B

AMP Data Acquisition Methods

The following table describes the different methods through which AMP acquires data from Aruba devices on the network.

Table 7 *Methods by which AMP Acquires Data from Aruba Devices*

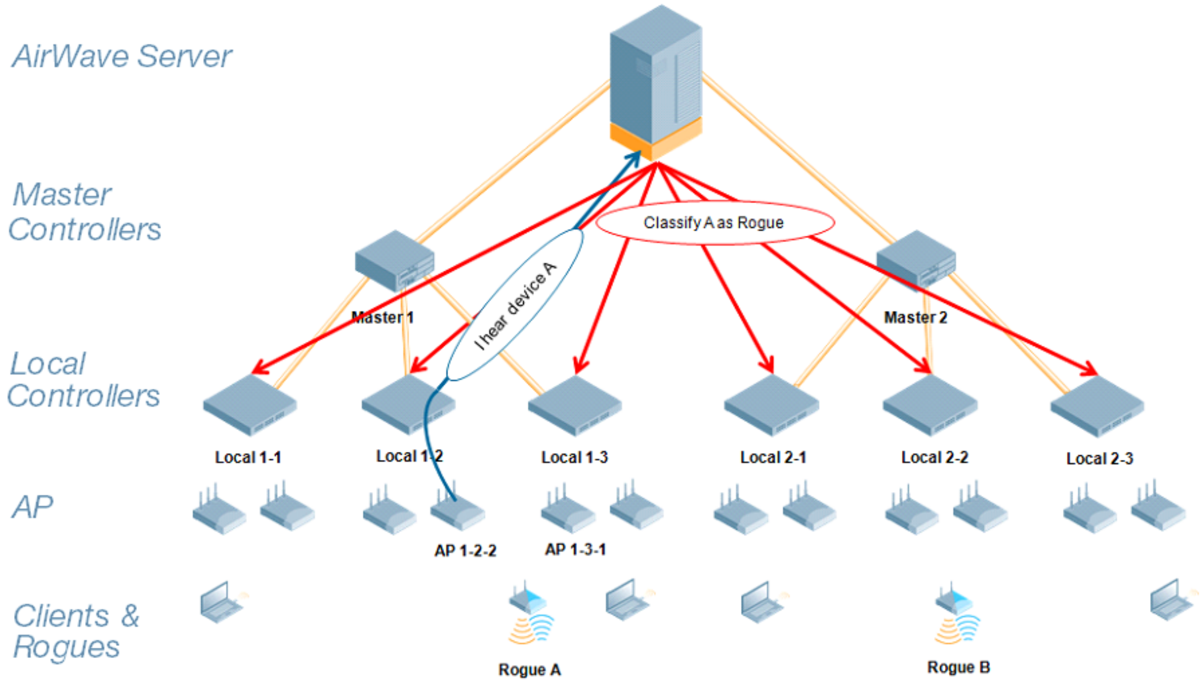
Data Elements	Controller/Thin AP						Aruba Instant
	SNMP MIB	**SNMP Traps**	**AMON**	**CLI/SSH**	**WMS Offload**	**RTLS**	**HTTPS**
Configuration interface							
Device configuration/audit				**X**			**X**
User and client interfaces							
Assoc/auth/roam	**X**	**X**					**X**
Bandwidth	**X**						**X**
Signal quality	**X**					**X**	**X**
Auth failures		**X**					*N/A*
AP/radio interfaces							
CPU And memory utilization	<-------------------------------*N/A*--------------------------------------->						**X**
Bandwidth	**X**						**X**
Transmit Power	**X**						**X**
Channel utilization			**X**				**X**
Noise floor	**X**						**X**
Frame rates	**X**						**X**
Error counters	**X**						**X**
Channel summary				**X**			*N/A*
ARM events		**X**					*N/A*
Active interferers			**X**				*N/A*
Active BSSIDs/SSIDs	**X**						**X**
Security							
IDS events		**X**					*N/A*
Neighbors/rogues	**X**				**X**		**X**
Neighbor re-classification				**X**	**X**		*N/A*
Client classification					**X**		*N/A*
User deauthorization				**X**			*N/A*

Appendix C

WMS Offload Details

WMS Offload instructs the master controller to stop correlating ARM, WIPS, and WIDS state information amongst its local controllers, because AMP will assume this responsibility. Figure 25 depicts how AMP communicates state information with local controllers.

Figure 25 *ARM/WIPS/WIDS Classification Message Workflow*



State Correlation Process

1. AP-1-3-1 hears rogue device A.
2. Local controller 1-3 evaluates devices and does initial classification and sends a classification request to the AMP.
3. AMP receives message and re-classifies the device if necessary and reflects this within AMP GUI and via SNMP traps, if configured.
4. AMP sends a classification message back to all local controllers managed by master controller 1, (1-1, 1-2, and 1-3).
5. AMP sends a classification message back to all additional local controllers managed by the AMP server. In this example all local controllers under master controller 2, (2-1, 2-2, and 2-3) would receive the classification messages.
6. If an administrative AMP user manually overrides the classification, then AMP will send a re-classification message to all applicable local controllers.

7. AMP periodically polls each local controller's MIB to ensure state parity with the AMP database. If the local controller's device state does not comply with the AMP database, AMP will send a re-classification message to bring it back into compliance.

NOTE

The Rogue Detail page displays a BSSID table for each rogue that displays the desired classification and the classification on the device.

Using AMP as Master Device State Manager

AMP offers the following benefits as a master device state manager:

- Ability to correlate state among multiple master controllers. This will reduce delays in containing a rogue device or authorizing a valid device when devices roam across a large campus.
- Ability to correlate state of third party access points with ARM. This will ensure Aruba infrastructure interoperates more efficiently in a mixed infrastructure environment.
- Ability to better classify devices based on AMP wire-line information not currently available in ArubaOS.
- AMP provides a near real-time event notification and classification of new devices entering air space.
- RAPIDS gains additional wire-line discovery data from Aruba controllers.

Appendix D

Increasing Location Accuracy

Understand Band Steering's Impact on Location

Band steering can negatively impact location accuracy when testing in highly mobile environment. The biggest hurdle is scanning times in 5 GHz frequency.

Table 8 *Location accuracy impact*

Operating Frequency	Total Channels	Scanning Frequency	Scanning Time	Total Time One Pass
2.4 GHz	11 (US)	10 seconds	110 milliseconds	121.21 seconds
5 GHz	24 (US)	10 seconds	110 milliseconds	242.64 seconds

Leveraging RTLS to Increase Accuracy

This section provides instructions for integrating the AMP, Aruba WLAN infrastructure and Aruba's RTLS feed to more accurately locate wireless clients and Wi-Fi Tags.

Deployment Topology

Figure 26 *Typical Client Location*

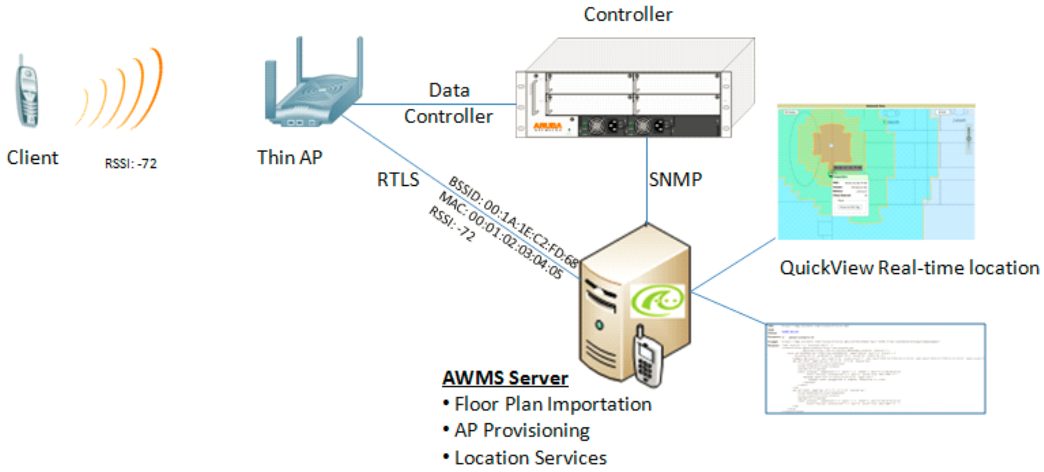
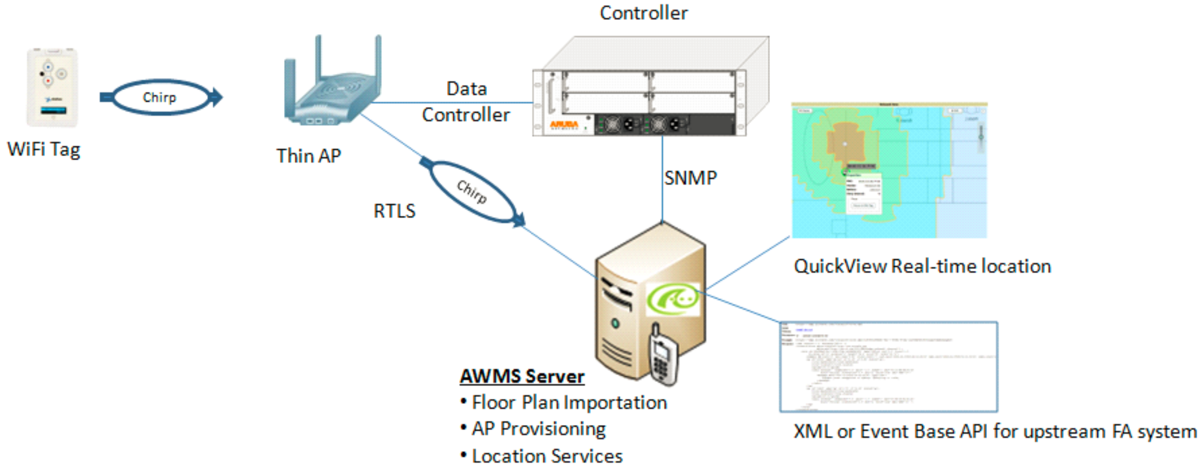


Figure 27 *Typical Tag Deployment*



Prerequisites

You will need the following information to monitor and manage your Aruba infrastructure.

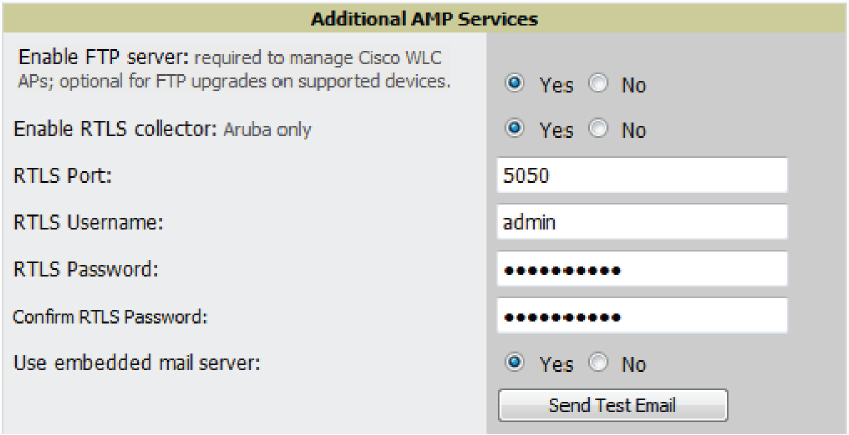
- Ensure AMP server is already monitoring Aruba infrastructure
- Ensure WMS Offload process is complete
- Ensure firewall configuration for port 5050 (default port) supports bidirectional UDP communication between the AMP server's IP address and each access point's IP address

Enable RTLS service on the AMP server

To enable RTLS service on the AMP server, follow these steps:

1. Navigate to **AMP Setup > General** and locate the **AMP Additional Services** section
2. Select **Yes** for the **Enable RTLS Collector** option.
3. A new section will automatically appear with the following settings:
   - **RTLS Port** - match controller default is 5050
   - **RTLS Username** - match the SNMPv3 MMS username configured on controller
   - **RTLS Password** - match the SNMPv3 MMS password configured on controller

Figure 28 *RTLS Fields in **AMP Setup > General***



Additional AMP Services

Enable FTP server: required to manage Cisco WLC APs; optional for FTP upgrades on supported devices.	● Yes ○ No
Enable RTLS collector: Aruba only	● Yes ○ No
RTLS Port:	5050
RTLS Username:	admin
RTLS Password:	●●●●●●●●●●
Confirm RTLS Password:	●●●●●●●●●●
Use embedded mail server:	● Yes ○ No
	Send Test Email

4. Select **Save** at the bottom of the page.

Enable RTLS on Controller

NOTE

RTLS can only be enabled on the master controller and it will automatically propagate to all local controllers.

SSH into master controller, enter **enable** mode, and issue the following commands:

```
(Controller-Name) # configure terminal
Enter Configuration commands, one per line. End with CNTL/Z

(Controller-Name) (config) # ap system-profile <Thin-AP-Profile-Name>

(Controller-Name) (AP system profile default) # rtls-server ip-addr <IP of AMP Server>
port 5050 key <Controller-SNMPv3-MMS-Password>

(Controller-Name) (AP system profile default) # write mem
```

To validate exit configuration mode:

```
(Controller-Name) # show ap monitor debug status ip-addr <AP-IP-Address>
...
RTLS configuration
-------------------
Type       Server IP   Port Frequency Active
----       ---------   ---- --------- ------
MMS        10.51.2.45 5070 120
Aeroscout N/A         N/A   N/A
RTLS       10.51.2.45 5050 60         *
```

Troubleshooting RTLS

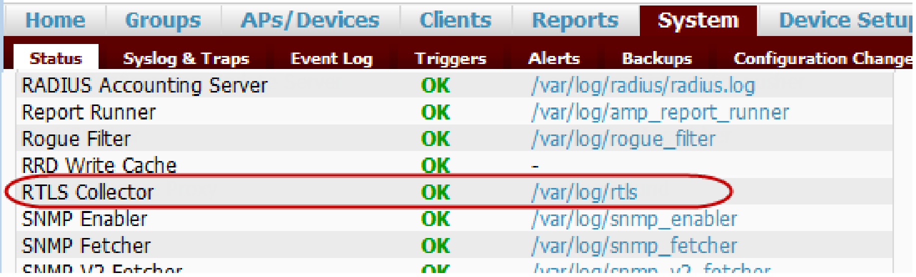
You can use either the WebUI or CLI to ensure the RTLS service is running on your AMP server.

Using the WebUI

Access the AMP WebUI and navigate to **System > Status.**

Scroll down Services list and look for the RTLS service, as shown below

Figure 29 *RTLS System Status*



RADIUS Accounting Server	OK	/var/log/radius/radius.log
Report Runner	OK	/var/log/amp_report_runner
Rogue Filter	OK	/var/log/rogue_filter
RRD Write Cache	OK	-
RTLS Collector	OK	/var/log/rtls
SNMP Enabler	OK	/var/log/snmp_enabler
SNMP Fetcher	OK	/var/log/snmp_fetcher

Using the CLI

Use SSH to access the command-line interface of your AMP server, and issue the following commands:

```
[root@AMPServer]# daemons | grep RTLS
   root     17859 12809 0 10:35 ?        00:00:00 Daemon::RTLS
```

Issue the **logs** and **tail rtls** commands to check the RTLS log file and verify that Tag chirps are making it to the AMP server.

```
[root@AMPServer]# logs
[root@AMPServer]# tail rtls
   payload:
   00147aaf01000020001a1ec02b3200000000100000137aae0100000c001a1ec02b320000001a1e82b322
   590006ddff02
   1224534900.588245 - got 96 bytes from 10.51.1.39 on port 5050
   Mon Oct 20 13:35:00 2008: 1224534900.588338 - got 96 bytes from 10.51.1.39 on port
   5050
   payload:
   0014c9c90100003c001a1ec050780000000200000013c9c70100000c001a1ec050780000000d54a7a280
   540001ddff020013c9c80100000c001a1ec050780000000cdb8ae9a9000006c4ff02
   1224534900.588245 - got 96 bytes from 10.51.1.39 on port 5050
   Mon Oct 20 13:35:00 2008: 1224534900.588338 - got 96 bytes from 10.51.1.39 on port
   5050
   payload:
   0014c9c90100003c001a1ec050780000000200000013c9c70100000c001a1ec050780000000d54a7a280
   540001ddff020013c9c80100000c001a1ec050780000000cdb8ae9a9000006c4ff02
```

Ensure chirps are published to Airbus by snooping on RTLS tag reports.

```
[root@AMPserver]# airbus_snoop rtls_tag_report
Snooping on rtls_tag_report:
Mon Oct 20 13:49:03 2008 (1224535743.54077)
%
    ap_mac => 00:1A:1E:C0:50:78
    battery => 0
    bssid => 00:1A:1E:85:07:80
    channel => 1
    data_rate => 2
    noise_floor => 85
    payload =>
    rssi => -64
    tag_mac => 00:14:7E:00:4C:E4
    timestamp => 303139810
    tx_power => 19
```

Verify external applications can see WiFi Tag information by exercising the Tag XML API:

```
https://<AMP-Server-IP>/visualrf/rfid.xml
```

You should see the following XML output:

```
<visualrf:rfids version=1>
 <rfid battery-level=0 chirp-interval= radio-mac=00:14:7E:00:4C:E0
    vendor=>
    <radio phy=g xmit-dbm=10.0/>
    <discovering-radio ap=SC-MB-03-AP10 dBm=-91 id=811 index=1
      timestamp=2008-10-21T12:23:30-04:00/>
    <discovering-radio ap=SC-MB-03-AP06 dBm=-81 id=769 index=1
      timestamp=2008-10-21T12:23:31-04:00/>
    <discovering-radio ap=SC-MB-01-AP06 dBm=-63 id=708 index=1
      timestamp=2008-10-21T12:23:31-04:00/>
    <discovering-radio ap=SC-MB-02-AP04 dBm=-88 id=806 index=1
    timestamp=2008-10-21T12:22:34-04:00/>
 </rfid>
 <rfid battery-level=0 chirp-interval= radio-mac=00:14:7E:00:4B:5C
    vendor=>
    <radio phy=g xmit-dbm=10.0/>
    <discovering-radio ap=SC-MB-03-AP06 dBm=-74 id=769 index=1
      timestamp=2008-10-21T12:23:20-04:00/>
    <discovering-radio ap=SC-MB-01-AP06 dBm=-58 id=708 index=1
```

```
      timestamp=2008-10-21T12:23:20-04:00/>
    <discovering-radio ap=SC-MB-03-AP02 dBm=-91 id=734 index=1
      timestamp=2008-10-21T12:23:20-04:00/>
 </rfid>
 <rfid battery-level=0 chirp-interval= radio-mac=00:14:7E:00:4D:06
    vendor=>
    <radio phy=g xmit-dbm=10.0/>
    <discovering-radio ap=SC-SB-GR-AP04 dBm=-91 id=837 index=1
      timestamp=2008-10-21T12:21:08-04:00/>
    <discovering-radio ap=SC-MB-03-AP06 dBm=-79 id=769 index=1
      timestamp=2008-10-21T12:22:08-04:00/>
    <discovering-radio ap=SC-MB-01-AP06 dBm=-59 id=708 index=1
      timestamp=2008-10-21T12:23:08-04:00/>
    <discovering-radio ap=SC-MB-02-AP04 dBm=-90 id=806 index=1
      timestamp=2008-10-21T12:22:08-04:00/>
 </rfid>
</visualrf:rfids>
```

Wi-Fi Tag Setup Guidelines

- Ensure that the tags can be heard by at least three (3) access points from any given location. The recommended value is is 4 APs.
- Ensure that the tags chirp on all regulatory channels.