AirWave 8.2.1

a Hewlett Packard
Enterprise company

Release Notes

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AirWave 8.2.1 is a software patch release that introduces fixes to issues detected in previous releases. For more information about the features described in the following sections, see the *AirWave 8.2 User Guide*, *Aruba 8.2 Supported Infrastructure Devices* document, and the *Aruba Instant in AirWave 8.2 Deployment Guide*.

Release Overview

- "New Features" on page 4 describes the new features introduced this release.
- "Features introduced in Previous Releases" on page 11 describes features introduced in previous releases of AirWave 8.2.
- "Supported Infrastructure Devices" on page 38 lists new devices and Instant devices supported by AirWave 8.2.x.
- "Resolved Issues" on page 40 describes issues resolved in AirWave 8.2.1 and previous releases.
- "Known Issues" on page 46 lists and describes the known issues identified in AirWave 8.2.1 and previous releases.

Contacting Support

Table 1: *Contact Information*

Main Site	arubanetworks.com
Support Site	support.arubanetworks.com
Airheads Social Forums and Knowledge Base	community.arubanetworks.com
North American Telephone	1-800-943-4526 (Toll Free) 1-408-754-1200
International Telephone	arubanetworks.com/support-services/contact-support/
Software Licensing Site	licensing.arubanetworks.com
End-of-life Information	arubanetworks.com/support-services/end-of-life/
Security Incident Response Team (SIRT)	Site: arubanetworks.com/support-services/security-bulletins/ Email: sirt@arubanetworks.com

Chapter 3
New Features

AirWave 8.2.1 introduces the following features and enhancements:

- "Support for New Devices" on page 4
- "Enhanced Support for Aruba Instant" on page 4
- "Refresh Option for VisualRF Heatmaps" on page 4
- "Enhanced Support Connection" on page 4
- "Enhanced HPE Aruba Switch Configuration" on page 5

Support for New Devices

AirWave supports several new Aruba devices. For more information, see "Support for New Devices in AirWave 8.2.1" on page 38.

Enhanced Support for Aruba Instant

AirWave supports template configuration for Instant 6.4.4.4-4.2.4.0.

Refresh Option for VisualRF Heatmaps

The toolbar on the **VisualRF > Floorplan** page displays a refresh button (↻) for regenerating and updating a floorplan heatmap. When you place a new AP on a floorplan, or add, delete or edit a wall, you can display updated heatmap information for that floorplan by clicking the refresh button. If you do not manually refresh the floorplan, the floorplan will still automatically update after one hour.

Enhanced Support Connection

A support connection is a point-to-point IP tunnel that is initiated from a AirWave server to Aruba's support server. AirWave 8.2.1 introduces changes to the process to launch a support connection, as well as security enhancements for the connection tunnel.

When you open a case with technical support, AirWave technical support sends you an email with instructions for downloading and installing a .tar file used to launch the support connection. You must contact Aruba technical support and provide login credentials before Aruba support staff can access your AirWave server.

Once the .tar file has been installed you can start, stop, or check the status of the support connection with the following commands:

- # service support_connection start [<days>]
- # service support_connection restart [<days>]
- # service support_connection stop
- # service support_connection status

By default, the support connection remains open for fourteen days unless it is stopped with the **# service support_connection stop** command. To start or restart a connection that does not expire, specify **0** for the optional <days> parameter.

Enhanced HPE Aruba Switch Configuration

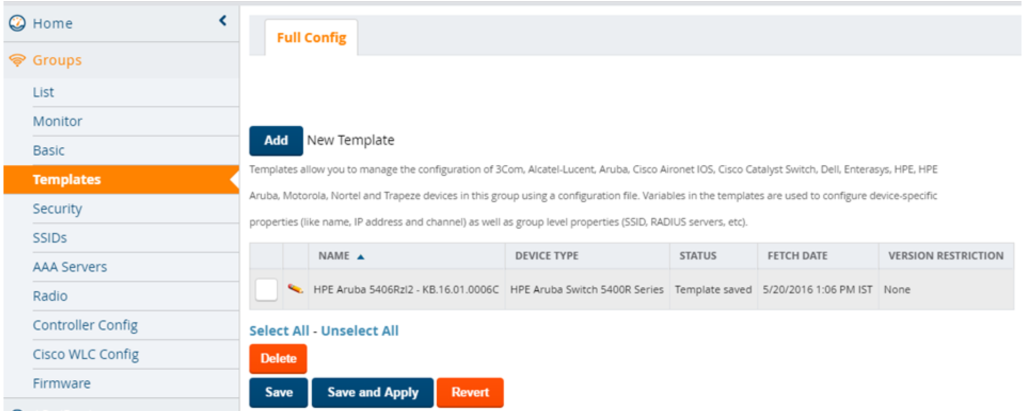
AirWave introduces a partial configuration option that allows you to push full template configurations, while also allowing you to send partial configurations to HPE Aruba switches. This feature is supported on HPE Aruba switches running firmware version 16.x or greater:

- 2620
- 2920
- 3800
- 3810
- 5400R
- 2530 YA
- 2530 YB
- 2930F

Enabling Partial Configuration

The default template configuration setting for a group of HPE Aruba switches pushes a full configuration to HPE Aruba switches in that group. Therefore, by default, when you select a group in the **Groups > List** page and then select **Groups > Templates**, the AirWave WebUI displays only the **Full Config** tab.

Figure 1: *Full Template Configuration*



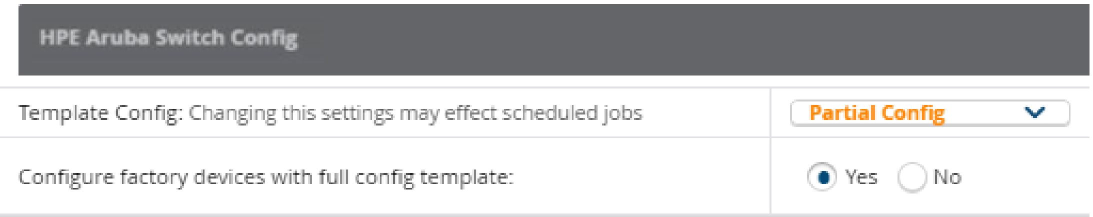
Templates allow you to manage the configuration of 3Com, Alcatel-Lucent, Aruba, Cisco Aironet IOS, Cisco Catalyst Switch, Dell, Enterasys, HPE, HPE Aruba, Motorola, Nortel and Trapeze devices in this group using a configuration file. Variables in the templates are used to configure device-specific properties (like name, IP address and channel) as well as group level properties (SSID, RADIUS servers, etc).

		NAME ▲	DEVICE TYPE	STATUS	FETCH DATE	VERSION RESTRICTION
□	✎	HPE Aruba 5406Rzl2 - KB.16.01.0006C	HPE Aruba Switch 5400R Series	Template saved	5/20/2016 1:06 PM IST	None

Use the following procedure to enable the partial configuration feature:

1. Navigate to **Groups > List** and select the group.
2. Navigate to **Groups > Basic**.
3. Scroll down to the **HPE Aruba Switch Config** section.
4. Click the **Template Config** drop-down list and select **Partial Config**.
5. There are two options you can select that indicate whether to push a full configuration template to Zero-Touch Provisioning (ZTP) devices before AirWave applies additional partial configuration changes.
    - **Yes**: If the group contains factory-default devices added to AirWave via ZTP, select **Factory Default Devices Only** from the **Push complete configuration file** drop-down list. This option requires that the ZTP devices reboot after the full configuration update.
    - **No**: Select this option to push a partial configuration to only HPE Aruba switches in the group. This option is not recommended for groups that contain factory-default devices.

Figure 2: *Enable Partial Template Configuration*

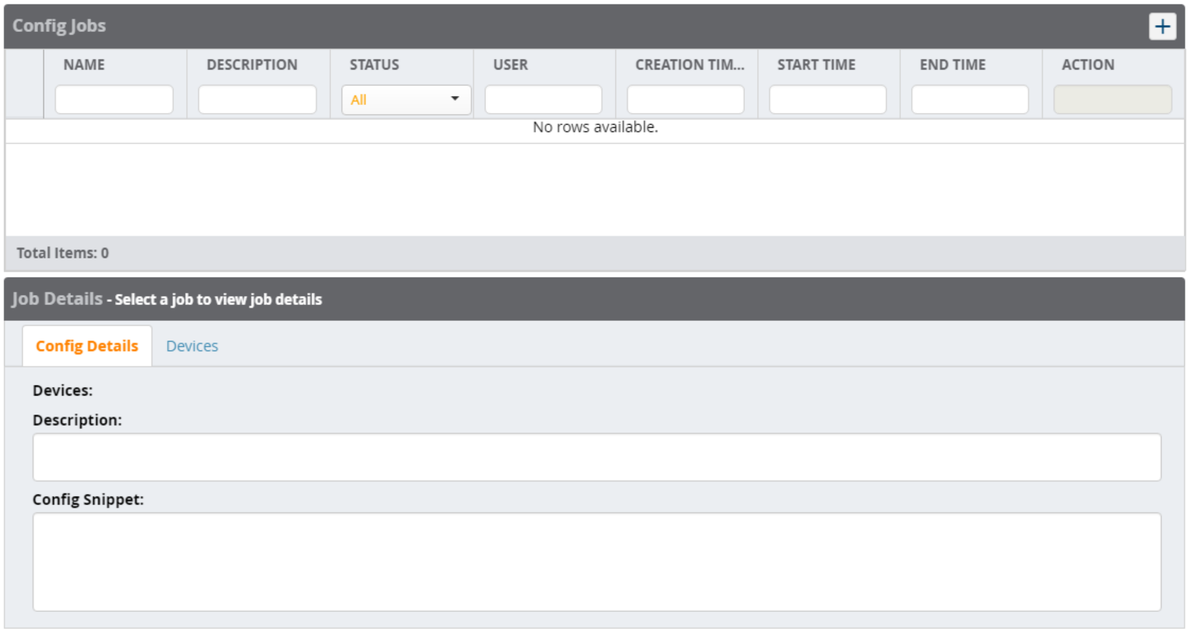


HPE Aruba Switch Config

Template Config: Changing this settings may effect scheduled jobs	Partial Config
Configure factory devices with full config template:	● Yes ○ No

6. Click **Save and Apply**, then click **Apply Changes Now** to save your settings. The AirWave WebUI displays the **Partial Config** tab on the **Groups >Templates** page for the selected group.
   - If you selected **Yes** in Step 5, the **Groups > Templates** page displays both the **Full Config** tab (for pushing full configurations to factory-default devices) and the **Partial Config** tab (for pushing partial configurations to configured devices in the group.)
   - If you selected **No** in Step 5, the **Groups > Templates** page displays the **Partial Config** tab only.

Figure 3: *Partial Template Configuration*



Config Jobs

NAME	DESCRIPTION	STATUS	USER	CREATION TIM...	START TIME	END TIME	ACTION
		All					

No rows available.

Total Items: 0

Job Details - Select a job to view job details

Devices:

Description:

Config Snippet:

Creating a Partial Configuration Job

To create a new partial configuration job:

1. From the **Groups > Templates** page click the **+** icon at the top of the **Config Jobs** table. The Config Jobs wizard opens.
2. In the **Config Command** tab, enter a name and (optionally) a description of the configuration job, then paste in a snippet of configuration or action commands. Click **Next** to continue to the next step in the wizard.
3. In the **Select Device** tab, click the checkmark to the left of any device name to select the devices to which you want to push the partial configuration setting. Click any of the column headings to sort the table by that column criteria, or enter a text string into any of the column heading fields to filter the table by that string. You can select one or more individual devices, or click the check mark in the upper left corner of the table to select all devices in the table. Click **Next** to continue to the next step in the wizard.
4. Use the **Schedule** tab to select when the job will run. The **Run Now** option is selected by default. To schedule the job for another time, uncheck the **Run Now** checkbox, and click inside the **Schedule Job** field. A calendar appears, allowing you to select a run date. You can also manually edit a schedule date and time by entering a schedule time in *YYYY/MM/DD HH:MM* format.

5. The **Confirm** tab displays details for your configuration job. Click **Confirm** to save these settings, or click **Back** to return to a previous page of the Wizard.

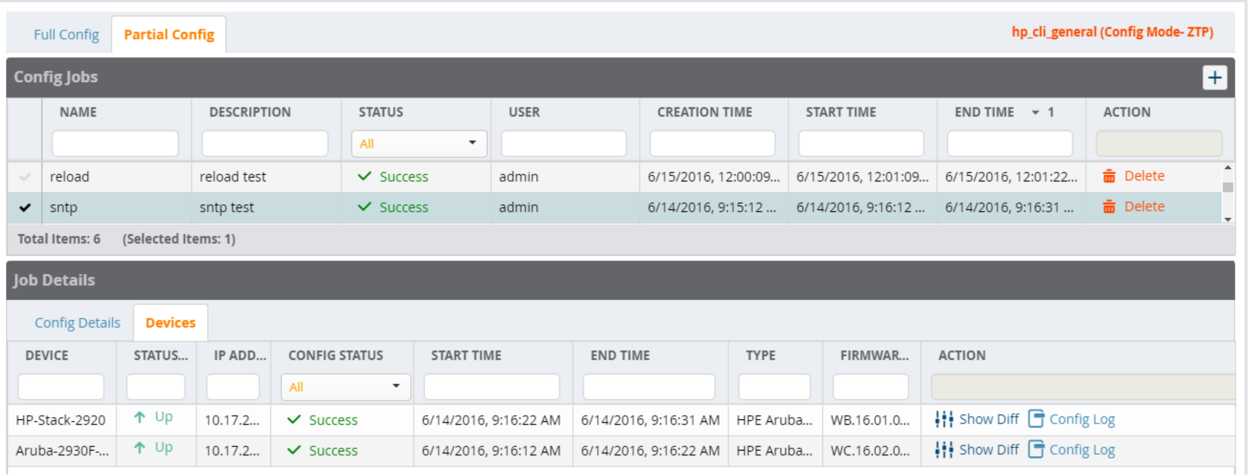
NOTE

If a group is configured to use Partial Configuration mode, the **Management Mode** option on the **APs/Devices > Manage** page is hidden for non-ZTP devices in the group.

Viewing, Reverting, or Deleting Partial Configuration Jobs

You can view information about partial configuration jobs and revert or delete them from the **Config Jobs** and **Job Details** tables on the **Groups > Templates > Partial Configuration** page.

Figure 4: ***Config Jobs*** *and* ***Job Details*** *tables.*



Full Config | Partial Config

hp_cli_general (Config Mode- ZTP)

Config Jobs

	NAME	DESCRIPTION	STATUS	USER	CREATION TIME	START TIME	END TIME ▾ 1	ACTION
			All ▾					
✓	reload	reload test	✓ Success	admin	6/15/2016, 12:00:09...	6/15/2016, 12:01:09...	6/15/2016, 12:01:22...	Delete
✓	sntp	sntp test	✓ Success	admin	6/14/2016, 9:15:12 ...	6/14/2016, 9:16:12 ...	6/14/2016, 9:16:31 ...	Delete

Total Items: 6 (Selected Items: 1)

Job Details

Config Details | Devices

DEVICE	STATUS...	IP ADD...	CONFIG STATUS	START TIME	END TIME	TYPE	FIRMWAR...	ACTION
			All ▾					
HP-Stack-2920	↑ Up	10.17.2...	✓ Success	6/14/2016, 9:16:22 AM	6/14/2016, 9:16:31 AM	HPE Aruba...	WB.16.01.0...	Show Diff Config Log
Aruba-2930F-...	↑ Up	10.17.2...	✓ Success	6/14/2016, 9:16:12 AM	6/14/2016, 9:16:22 AM	HPE Aruba...	WC.16.02.0...	Show Diff Config Log

The **Config Jobs** table displays the following information for the partial configuration jobs created for that group of HPE Aruba switches. Click any of the column headings to sort the table by that column criteria, or enter a text string into any of the column heading fields to filter the table by that string. You can also change the order in which the information is displayed in the table by selecting any column heading and dragging that column to a new position within the table.

Table 2: ***Config Jobs*** *Table Information*

Column	Description
Name	Name of the configuration job.
Description	Description of the configuration job.
Status	The partial configuration job can be in several states. - **Scheduled**: The partial configuration job will run in the future. - **Failed**: The partial configuration job failed to run on one or more devices. - **Success**: The partial configuration job completed successfully on all devices. - **Pending**: The job has been scheduled, but the configuration changes have not been pushed to all selected devices. - **In Progress**: The job started and configuration changes are in progress but are incomplete. **NOTE:** Hover your mouse over the **Status** column to view detailed status information for all devices selected to receive the partial configuration update.
User	Username of the user who created the partial configuration job.
Creation Time	Timestamp showing the date and time of the partial configuration job creation.
Start Time	Timestamp showing the date and time the partial configuration job started.

Table 2: *Config Jobs Table Information (Continued)*

Column	Description
End Time	Time of partial configuration job completion for all devices
Action	Click the Delete icon in this column to delete a partial configuration job.

Viewing Job Information

To view additional information about a job:

1. Click a checkbox at the left side of the **Config Jobs** table to select a specific configuration job.
2. Click the **Config Details** tab to view the job name, description and configuration.

Viewing Device Information

To view information about the devices to which a partial configuration is pushed:

1. Select a configuration job in the **Config Jobs** table.
2. Click the **Devices** tab to display the **Devices** table. The **Devices** table displays the following information for selected partial configuration jobs.
3. Click any of the column headings to sort the table by that column criteria, or enter a text string into any of the column heading fields to filter the table by that string. You can also change the order in which the information is displayed in the table by selecting any column heading and dragging that column to a new position within the table.

Table 3: ***Devices*** *Table Information*

Column	Description
Device	Name of the device to which the partial configuration job is pushed.
Status	Shows whether the device is up or down.
IP Address	IP address of the device.
Config Status	Current status of the device configuration job: • **Failed**: At least one command failed in the configuration snippet push for the device. • **Skipped**: The device was down, so the configuration snippet push has been skipped for the device. • **Success**: All the commands in the configuration snippet push to the device was successful. • **Reverted**: After a configuration snippet failed to be pushed to the device, it was successfully reverted to its previous configuration by receiving a full configuration push and rebooting. • **Reverting**: The device is in the process of reverting to its previous configuration after a config snippet push failure. • **Pending**: The configuration snippet push has been scheduled to start, but the configuration changes have not yet been pushed to the device. • **In Progress**: The configuration snippet push has started, and configuration changes are in progress but are not yet completed. **NOTE:** Hover your mouse over the **Config Status** column to view the amount of time it took for that configuration job to run on the device.
Device	Name of the device to which the partial configuration is pushed.
Start Time	Timestamp showing the date and time the configuration job was started.

Table 3: *Devices Table Information (Continued)*

Column	Description
End Time	Timestamp showing the date and time the configuration job was completed for that device.
Type	Shows the device type . For example, HPE Aruba 2920-24G-PoE+.
Action	Select any of the icon links to view additional information: • **Telnet Log** : View a log of telnet commands pushed by the partial configuration job. This action is only available for partial configuration snippets that contain action (and not configuration) commands. • **Show Diff** : Display the previous and current configurations in two side-by-side windows, with the differences between these two configurations highlighted. This action is only available for partial configuration snippets that contain configuration (and not action) commands. • **Config Log** : View a log of configuration commands pushed by the partial configuration job. This action is only available for partial configuration snippets that contain configuration (and not action) commands.

Reverting or Deleting Partial Configuration Jobs

To revert partial configuration jobs that failed or delete job details you don't want to keep:

1. Select the partial configuration job from the **Config Jobs** table.
2. Click **Revert** in the **Action** column if you want to reset the device to its previous configuration. Or you can click **Delete** and remove the job details.

Audit in AirWave for Partial Config

The Audit tab appears in the AirWave WebUI under the following conditions:

- The **Audit** Tab appears only for devices in the group configured via Zero-Touch Provisioning (ZTP) with a device state as “Factory”, when the template configuration mode is set to **Partial Config**, and the **Configure factory devices with full config template** option is set to **Yes**.
- The **Audit** Tab does not appear for any devices in the group if the template configuration mode is set to **Partial Config**, and the **Configure factory devices with full config template** option is set to **No**.
- The **Audit Tab** appears for all devices in the group if the template configuration mode is set to **Full Config**.

Configuration Caveats

A partial configuration snippet supports either action commands (executed in enable mode) or config commands (executed in config) mode. Partial configuration does not allow you to send both action *and* config commands in a single configuration snippet.

NOTE

> Any partial configuration snippet that contains an action command is automatically run in enable mode, causing configuration commands in that snippet to fail.

This feature supports the following action commands:

- backup
- boot
- clear
- copy
- debug / no debug
- erase
- kill
- reload
- upgrade-software
- stacking
- reboot
- reset
- schedule
- restore
- vsf

Configuration commands that require an immediate reboot should appear at the end of a partial configuration snippet. If a command requiring a reboot appears in the middle of a snippet, all subsequent commands are skipped, the job status appears as **failed**.

Some configuration commands generate output, such as the command **password manager user-name "manager" plaintext "airwave."** If a partial configuration snippet contains a configuration command that generates output, AirWave may display a **failed** job status for that command, even if it executes successfully.

Interdependency Commands

There are some commands which require some other dependent commands to be executed. In such case, it is the Network Administrator's responsibility to enter the dependent commands in order, so that the config snippet job will be successful. If dependent commands are missing or if they are entered out of order, then the job will fail.

This chapter describes features introduced in the following releases:

- "New Features in AirWave 8.2.0.3" on page 11
- "New Features in AirWave 8.2" on page 13

New Features in AirWave 8.2.0.3

AirWave 8.2.0.3 introduces the following new features and enhancements.

Enhanced Support for Aruba Instant

AirWave 8.2.0.3 introduces template and Instant GUI configuration (IGC) support for Instant 6.4.2.6-4.1.3.0 and 6.4.2.6-4.1.3.1. Although AirWave supports template configuration for Instant 6.4.4.4-4.2.4.0, you must manually configure the wired port profile from the Instant command line interface using the **wired-port-profile <profile> [no] trusted** command.

Security Improvements

Improvements have been made to the PAPI protocol, which is used by AirWave, Aruba Instant, and ArubaOS for management and control functions.

Resolution for AirWave Management Platform Multiple Vulnerabilities

In previous versions of AirWave, the management interface of an underlying system component called RabbitMQ was inadvertently exposed to the network through removal of a firewall rule. Improvements to this management interface in AirWave 8.2.0.3 resolve the following security advisories: ARUBA-PSA-2016-005 and CVE-2016-2032.

Resolution for PAPI Protocol Listener Exposed for Aruba Instant

AirWave 8.2.0.3 now supports Instant 4.1.3.x, which has been improved to not auto-populate firewall rules to permit PAPI when the IAP is in standalone mode. In non-standalone mode, a new Instant configuration setting has been added to disable auto-population of firewall rules to allow PAPI. When this setting is enabled, PAPI can be selectively permitted or blocked using firewall rules. This improvement resolves an issue in the following security advisories: ARUBA-PSA-2016-004, CVE-2016-2031, CVE-2016-0801, and CVE-2016-08.

Resolution for PAPI Authentication Bypass for Aruba Instant

PAPI messages contain a session ID to ensure that a valid administrative session is logged in to the WebUI. AirWave 8.2.0.3 supports Instant 4.1.3, which includes a security enhancement which prevents an unauthenticated user from using a PAPI vulnerability to execute commands on the IAP, including downloading the complete configuration file. This improvement resolves issues in the following security advisories: ARUBA-PSA-2016-004, CVE-2016-2031, CVE-2016-0801, and CVE-2016-0802.

Resolution for ArubaOS PAPI Vulnerabilities

This release fixes the issues in security advisory ARUBA-PSA-2016-006. Changes include:

- MD5 message validation with a key
- Improved PAPI encryption
- Message validation without a common static key for Aruba devices

If PAPI security is enabled in AirWave, AirWave will only process PAPI messages from a controller running ArubaOS 6.5 or later, where the controller PAPI security feature is also enabled.

Resolution for OpenSSL Vulnerabilities

The following OpenSSL vulnerabilities have been resolved:

- Denial of service or other impact using a malformed DSA private key (CVE-2016-0705)
- Denial of service vulnerability against a server which processes public keys, certificate requests or certificates (CVE-2015-1788)

Linux Security Updates

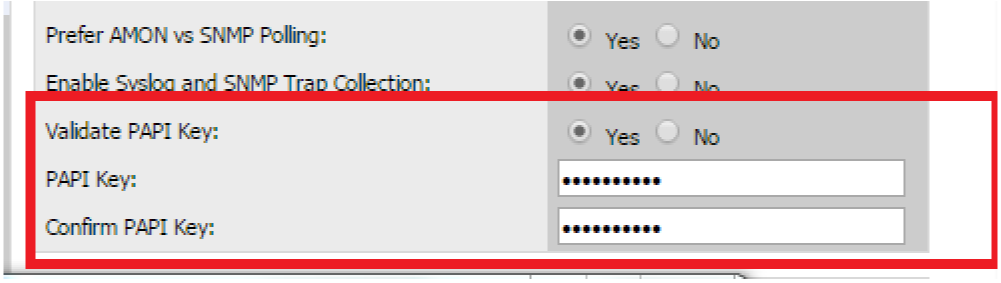
This release supports the following Linux updates:

- nss-util security update (RHSA-2016:0370-1)
- glibc security and bug fix update (RHSA-2016:0175-1)
- kernel security and bug fix update (RHSA-2015:2636-1)
- nss, nss-util, and NSPR security update (RHSA-2016:0591-1)

Configurable PAPI Key

Previous versions of AirWave supported only a single PAPI security key for all Aruba devices. Security improvements in this release allow you to specify a custom PAPI key and require PAPI key validation. You configure these settings on the **AMP Setup > General > Additional AMP Service** page.

Figure 5: *PAPI key validation*



Prefer AMON vs SNMP Polling: ● Yes ○ No

Enable Syslog and SNMP Trap Collection: ● Yes ○ No

Validate PAPI Key: ● Yes ○ No

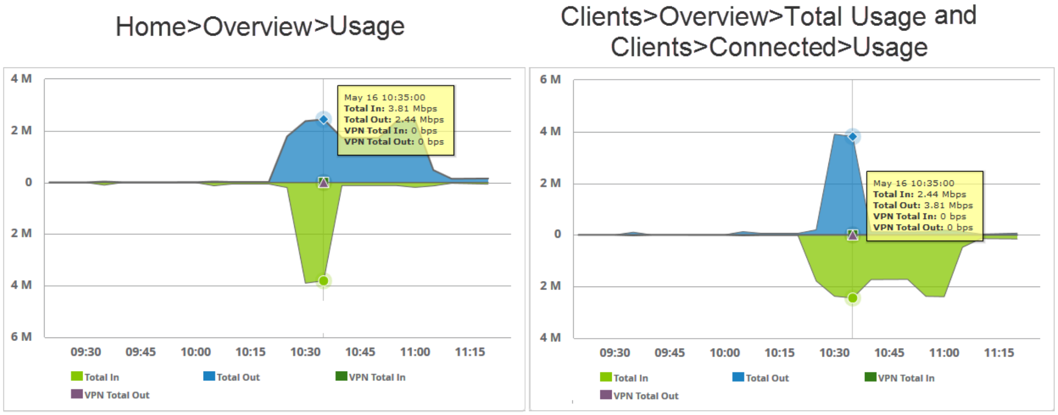
PAPI Key: ••••••••••••

Confirm PAPI Key: ••••••••••••

Client Usage Graph Improvements

AirWave 8.2.0.3 improves client usage graphs on the **Clients > Connected** and **Clients > Overview** pages of the AirWave WebUI. These improvements include using consistent labels for inbound and outbound traffic, called PAPI key and Total Out, and a similar axis for both graphs.

Figure 6: *Client Usage graph improvements*



In the graph on the left, Total In and Total Out represents data going to the AP and leaving the AP, respectively. In the graph on the right, Total In represents the traffic going in to the client; Total Out represents data going from the client to the AP.

New Features in AirWave 8.2

This section contains information about features added in AirWave 8.2. There were no new features in AirWave 8.2.0.1 or 8.2.0.2.

High Availability of APs

AirWave 8.2 introduces support for pairs of HP Unified Wired-WLAN (UWW) devices operating in HA mode. AirWave will monitor the status of each controller. After AirWave detects that a failover occurred and the APs failed over to the backup controller, AirWave properly displays the status of the APs.

Updated User Interface

AirWave 8.2 introduces an updated user interface. The statistics toolbar at the top of the AirWave window uses new icons to display network health data. Click any of these icons to view detailed information for each user or device category.

Table 4: *Network Statistics Icons*

Icon	Description
◎	Number of APs, controllers and switches that have not yet been authorized and added to AirWave
↑	Number of active APs, controllers and switches seen by AirWave. This icon can represent active wired and wireless **devices**, or just **active** wireless devices. To select which statistic (wired and wireless, or just wireless) is represented by this icon, modify the icon settings at the **AMP Setup > General > Top Header**.
↓	Number of inactive APs, controllers and switches seen by AirWave. This icon can represent inactive wired and wireless devices, or just active wireless devices. To select which statistic (wired and wireless, or just wireless) is represented by this icon, modify the icon settings at the **AMP Setup > General > Top Header**.
∾	Number of active wired devices that have not yet been authorized and added to AirWave.
∾	Number of inactive wired devices seen by AirWave.

Table 4: *Network Statistics Icons (Continued)*

Icon	Description
⟳⚠	Number of mismatched devices. A device is considered to be mismatched if the settings on the device are different than the group configuration settings for the device stored in the AirWave database.
⊘	Number of rogue devices detected on the network.
👤	Number of WLAN clients seen by AirWave.
🖥	Number of VPN clients or VPN sessions seen by AirWave. To select which statistic (clients or sessions) is represented by this icon, modify the displayed icon settings on the **AMP Setup > General > Top Header** fields.
⚠	Number of AirWave alerts.

The navigation menu now appears on the left side of the browser window in a collapsible navigation bar that you can hide or display by clicking the arrow in the upper right corner of the toolbar. This navigation menu contains the same menu options in the same order as before.

Figure 7 shows the location of the **APs/Devices > New** subheading in AirWave 8.2, and Figure 8 shows the **APs/Devices > New** subheading in an earlier version. Note that the top level headings and subheadings remain in the same relative locations in the new UI.

Figure 7: *Left Navigation Menu in AirWave 8.2*

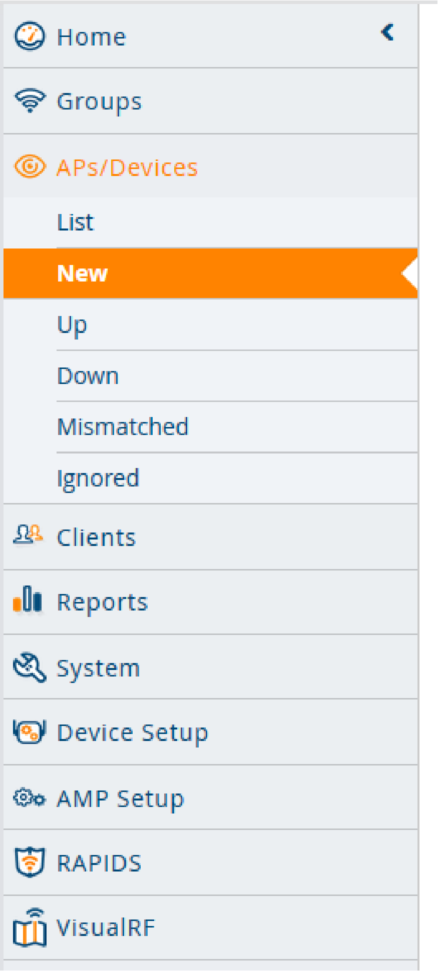
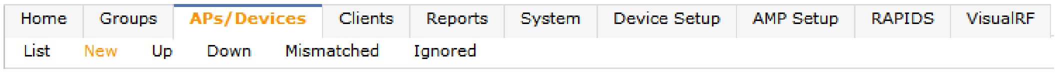


Figure 8: *Top Navigation prior to AirWave 8.2*



Clarity Monitoring

The Clarity Monitoring dashboard shows the progress of a client as it completes the following four steps to gain access to the WLAN:

- Associating to the network
- Completing authentication
- Obtaining an IP address via DHCP
- DNS resolution

AirWave receives this data via AMON messages sent from the controllers on the network.

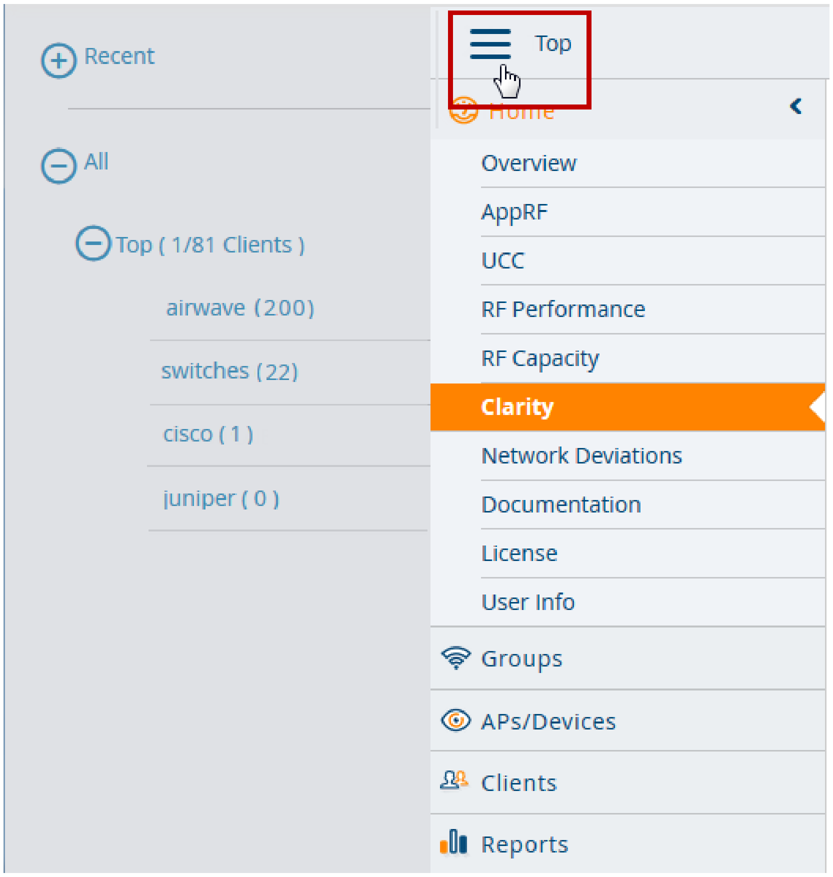
NOTE

Clarity monitoring is a beta feature in AirWave 8.2, and is supported by controllers running ArubaOS 6.4.3 and later releases.

The Clarity dashboard contains graphs and tables to help you identify failures in each step of the process. The default view for the Clarity monitoring page displays data for all devices connecting to the WLAN during the previous two hours. You can drill down and view data for devices associating to APs in a specific subfolder, or view data for a different time interval.

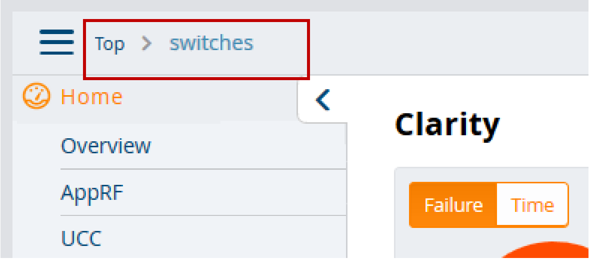
To display Clarity information for devices associated to a specific AirWave folder, click the Menu icon (≡) in the upper right corner of the Clarity window. This opens a popup window that allows you to select a subfolder.

Figure 9: *Select a Clarity Folder*



The path for the new selected folder appears at the top of the page.

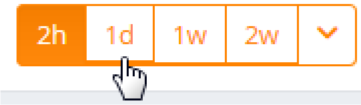
Figure 10: *Selected Folder path*



Data Time Ranges

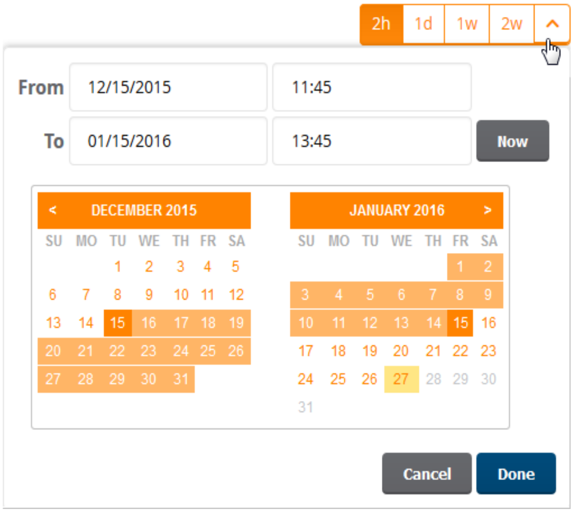
To display Clarity data for the previous day, week, or two weeks, select a time range option at the top of the Clarity monitoring page. The page will immediately refresh and display the updated information.

Figure 11: *Select a Clarity Time Range*



To select a custom time range, click the down arrow on the end of the time range toolbar. This option opens a popup window that allows you to define custom start and end times for your Clarity data tables.

Figure 12: *Select a Clarity Custom Time Range*



From 12/15/2015 11:45

To 01/15/2016 13:45

< DECEMBER 2015

SU	MO	TU	WE	TH	FR	SA
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

JANUARY 2016 >

SU	MO	TU	WE	TH	FR	SA
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Clarity can be configured to retain server statistics for up to thirty days, and retain client statistics for up to seven days. To modify the default retention intervals (seven days of server statistics and two days of client statistics), navigate to **AMP Setup > General > Historical Data Retention**, and enter new values in the **Clarity Server Stats Retention Interval** and **Clarity Client Stats Retention Interval** fields.

Clarity Graph and Table Data

The Clarity page includes the following graphs and tables.

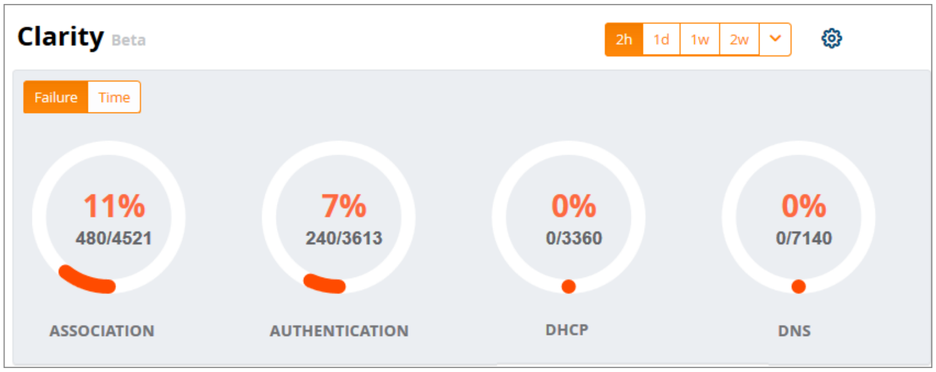
- "Live Statistics Dashboard" on page 17
- "Summary Table" on page 18
- "Authentication Failure Data" on page 19
- "DHCP Failure Data" on page 19
- "DNS Failure Data" on page 20
- "Association Data" on page 20

By default, each Clarity table displays entries for 25 devices or folders with the lowest performance levels. The clarity To display additional Clarity information for each table, or for information on modifying and sorting Clarity tables, see "Modifying Clarity Thresholds" on page 20

Live Statistics Dashboard

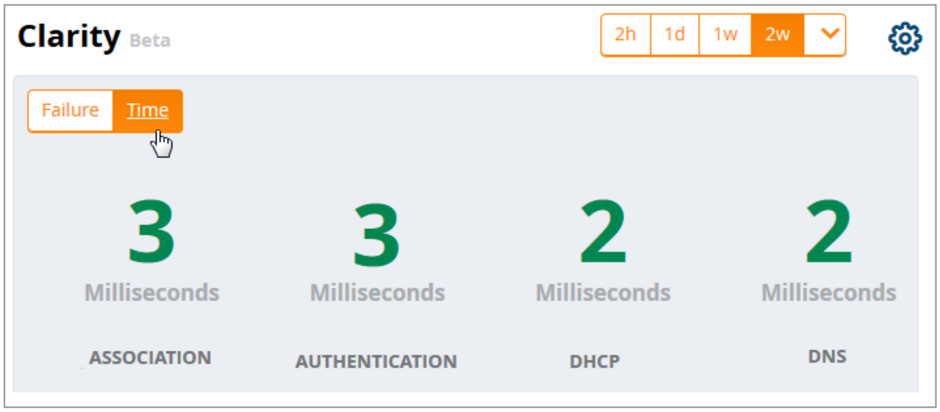
The **Live** statistics dashboard displays information for the failures in each process as a client associates and authenticates to the network, receives an IP address via DHCP, and resolves the IP address to a hostname via a DNS server. When you navigate to the **Home > Clarity** page, the **Live** dashboard displays the percentage of failures for each process, the number of failures, and the total number of attempts (both failed and successful) over the selected time period, as shown in Figure 13.

Figure 13: *Clarity Live Dashboard Showing Failure Rates*



To display the average process times over the selected time interval, click the **Time** option in the upper left corner of the dashboard, as shown in Figure 14.

Figure 14: *Clarity Live Dashboard Showing Average Process Times*



Summary Table

The **Summary** table on the **Home > Clarity** page is a color-coded dashboard that indicates the health and quality of the association, authentication and DHCP processes over the selected time period. Each icon in the table represents quality thresholds for the number failures *and* the average amount of time it takes the process to complete. The icon color represents aggregate data for failures and process times. For example, if a process has a high failure rate but a good process time, the icon will be red, indicating the most severe threshold crossed in either category. Hover your mouse over any icon to display the number of authentication process failures and successes for clients associating to individual APs or folders of APs, as well as the average time it took for each process to complete.

Table 5: *Default Summary Table Thresholds*

Icon Color	Description	Process Time Thresholds	Failure Rate Threshold
🟢	Good failure rate *and* process time	• Good Association time: <10 ms • Good Authentication time: <500ms • Good DHCP time: <100 ms • Good DNS time: <100 ms	< 10% failures
🟡	Fair failure rate *or* process time	• Fair Association time: 10 -20 ms • Fair Authentication time: 500-1000ms • Fair DHCP time: 100 - 200ms • Fair DNS time: 100 -200ms	>10% to 20% failures

Table 5: *Default Summary Table Thresholds (Continued)*

Icon Color	Description	Process Time Thresholds	Failure Rate Threshold
🔴	Poor failure rate *or* process time.	- Poor Association time: >20 ms - Poor Authentication time: >1000 ms - Poor DHCP time: >200 ms - Poor DNS time: >200ms	>20% failures

By default, the **Summary** table displays data for up to 25 subfolders or APs. If the selected Clarity folder contains more than 25 subfolders or APs, the **Summary** table displays only the 25 subfolders and APs with the lowest performance levels.

By default, the **Summary** table displays aggregate data for folders. Click the APs (◎) icon to display information for individual APs. Click the folder icon (📁) to return to the default folder view.

Authentication Failure Data

The **Authentication** table on the **Home>Clarity** page displays the following information for the client authentication processes on the network.

Table 6: *Authentication Table fields*

Column	Description
Servers	IP address of an authentication server.
Type	Indicates the authentication server type: - Dot1x: 802.1x - Captive Portal: Captive portal authentication - MAC Auth:MAC authentication - WPA-PSK: WPA encryption with pre-shared key (PSK) authentication
Failures (%)	This column shows the percentage of authentication failures for that server, followed by the total number of failures and the total number of authentication attempts over the selected time interval.
Avg. Time (ms)	The average time it took to successfully complete the authentication process over the selected time interval. Times for both failed and successful attempts are calculated in this average.

Click the graph icon (📈) in the table heading to display of graph of average authentication times for each server during the selected time interval. Hover your mouse over any section of the graph to view details about the authentication times during that portion of the time interval, or click the table icon (▤) to return to the table view.

DHCP Failure Data

The **DHCP** table on the **Home > Clarity** page displays the following information for authentication on the network.

Table 7: *DHCP Table fields*

Column	Description
Servers	IP address of a DHCP server.
Avg. Time (ms)	The average time it took to successfully complete the DHCP provisioning process over the selected time interval. Times for both failed and successful attempts are calculated in this average.

Click the graph icon (📈) in the table heading to display of graph of DHCP times for each server during the selected time interval. Hover your mouse over any section of the graph to view details about the DHCP provisioning times during that portion of the time interval, or click the table icon (☰) to return to the table view.

DNS Failure Data

The **DNS** table on the **Home > Clarity** page displays the following information for DNS resolution attempts.

Table 8: *DNS Table fields*

Column	Description
Servers	IP address of a DNS server.
Failures (%)	This column shows the percentage of DNS resolution failures for that server, followed by the total number of failures and the total number of DNS resolution attempts over the selected time interval.
Avg. Time (ms)	The average time it took to successfully complete the DNS resolution process over the selected time interval. Times for both failed and successful attempts are calculated in this average.

Click the graph icon (📈) in the table heading to display of graph of DNS resolution times for each server during the selected time interval. Hover your mouse over any section of the graph to view details about the resolution times during that portion of the time interval, or click the table icon (☰) to return to the table view.

Association Data

The **Association** table on the **Home > Clarity** page displays the following information for association times and failures on the network.

Table 9: *Association Table fields*

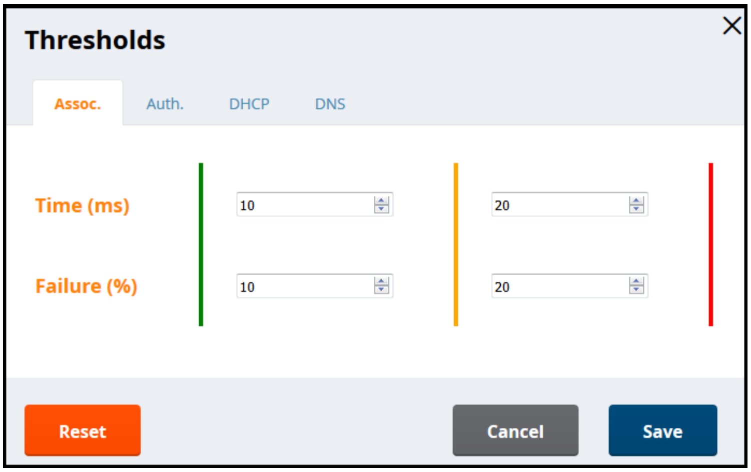
Column	Description
APs	Name of an AP.
Failures (%)	This column shows the percentage of failed association attempts failures for that AP, followed by the total number of failures and the total number of association attempts over the selected time interval.
Avg. Time (ms)	The average time it took to for a client to associated to the AP over the selected time interval. Times for both failed and successful attempts are calculated in this average.

Click the graph icon (📈) in the table heading to display of graph of association times for each AP during the selected time interval. Hover your mouse over any section of the graph to view details about the association times during that portion of the time interval, or click the table icon (☰) to return to the table view.

Modifying Clarity Thresholds

To modify any of the default thresholds for good, fair or poor performance, select the options (⚙) icon at the top of the page and specify a new process time or failure count for any threshold. Figure 15 shows the default thresholds for client association times. Modify the numbers in the first column to raise or lower the threshold for a *good* association time or failure rate. Modify the numbers in the second column to raise or lower the threshold for a *poor* association time or failure rate. The values between the two numbers represent the *fair* range of association and failure rate values.

Figure 15: *Clarity Association Thresholds*



Thresholds

Time (ms) 10 20

Failure (%) 10 20

.

Sorting and Filtering Clarity Data

Select any column heading in a Clarity table to sort the table by that value.

By default, each Clarity table displays entries for 25 devices with the lowest performance levels. To display additional Clarity data, including entries that do not appear on the main Clarity page:

1. Click the **Details** link at the bottom of a Clarity table. A **Details** popup window appears.
2. Click the **per page** dropdown list in the lower left corner of the window and select the number of entries to be displayed on the page.

You can also select one or more column headings in the **Details** page to sort or filter the table by the selected values.

Exporting Clarity Data

Click the Menu icon (≡) by a Clarity table titlebar to display the following list of data export options and table display settings.

- **Export all data as csv**: Export the entries currently displayed in the table to a .csv formatted file.
- **Export visible data as csv**: Export all entries recorded for the selected time frame to a .csv formatted file.
- **Export all data as pdf**: Export the entries currently displayed in the table to a PDF.
- **Export visible data as pdf**: Export all entries recorded for the selected time frame to a PDF
- **Details**: Display the details window for the table.
- **Columns**: Click a column heading to hide or display a column in the table.

Enhanced AppRF Analysis

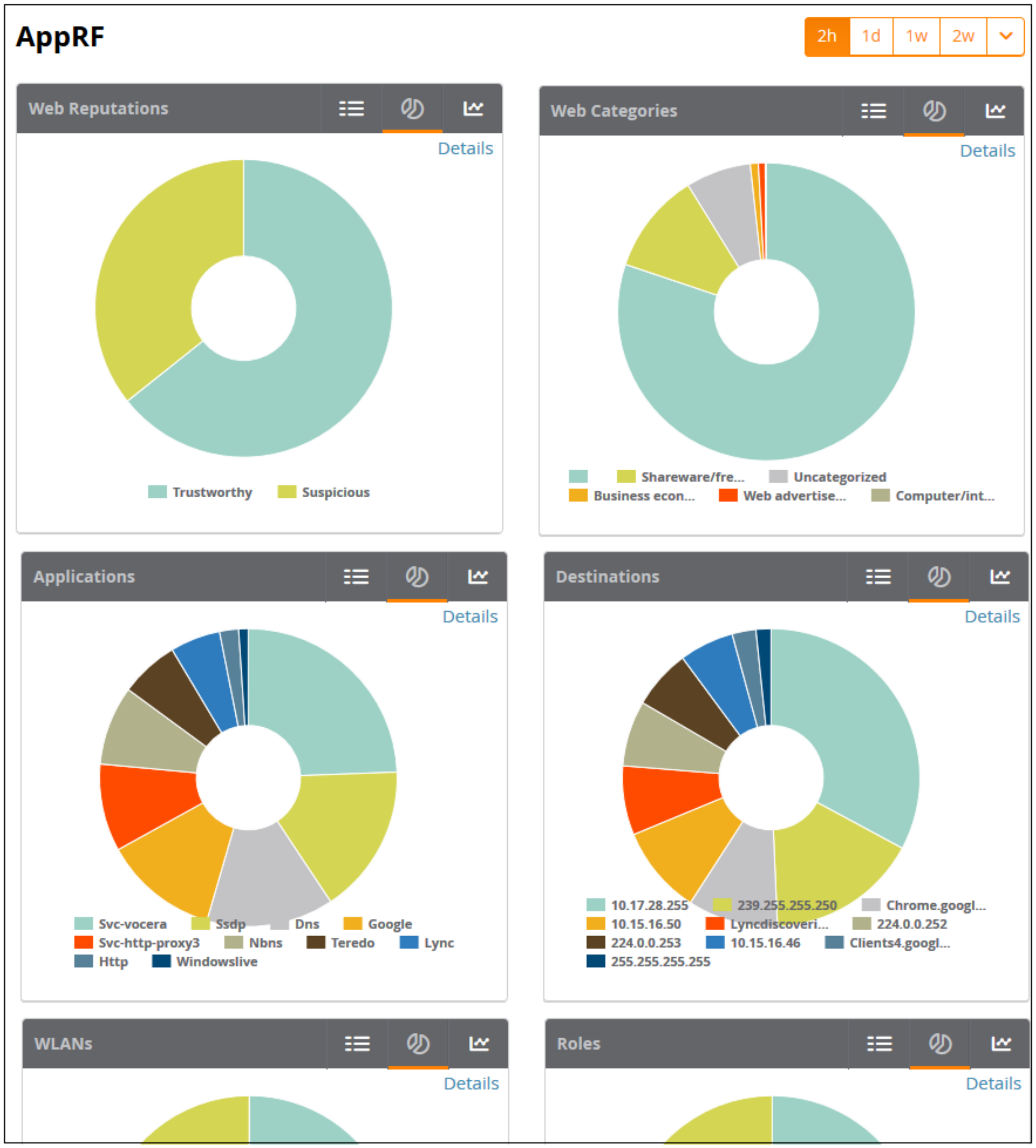
The following enhancements have been made to the **Home > AppRF** page:

- AppRF dashboard
- Widget directives

AppRF Dashboard

The AppRF dashboard provides a comprehensive overview on the different widgets available for AppRF. Each widget is presented as a directive, with various functions to view in-depth details on the users and applications within a widget.

Figure 16: *AppRF Dashboard (Partial)*



Each widget contains toggle buttons to switch between the following views:

- ☰ - List showing all the categories within the widget
- ◔ - Donut chart representing the proportional usage of categories
- 📈 - Usage graph displaying usage (in MB) over time

Widget Directives

The AppRF dashboard displays each widget as a directive containing the following functions:

- **List**: List of categories available for each specific widget (for example, Application Categories: Social Media, Torrent, Chat Protocols, Games, Web Development Tools, Ad Blocker).
- **Details Link**: Link to the **Details** page, where you can view the following information for each category:
  - **Category**: Name of the user
  - **Bytes**: Total usage in bytes (MB)

- **Packets**: Total number of packets transmitted/received
- **Web Reputation**: Web reputation, indicating the safety of the site.
- **Web Category**: Website type
- **Destination**: Number of destinations reached through the given category
- **User Role**: Number of roles assigned to the user
- **Devices**: Number of devices connected to the given category
- **User Name**: Name of the user
- **Device MAC**: MAC address of the user
- **WLANs**: Number of WLANs to which the user is connected

NOTE

Before you can view **Web Reputation** and **Web Category** information on the **Details** page, you must enable the web content classification feature on the controller, and define a server for name and IP address resolution. To enable these features, access the controller command line interface and issue the commands **firewall web-cc** and **ip name-server**. For more information, refer to the *ArubaOS User Guide*.

- **Category Details**: Under the **Details** page of each widget, you can select a category to view details for the individual category.
- **Donut Chart**: Chart representing the proportional usage of categories within a widget. Hover your mouse above each section of the chart to view the category name and usage, in KB and percentage (%).
- **Usage Graph**: Graph displaying usage over time.

UCC Enhancements

AirWave 8.2 introduces a number of enhancements to the call details provided on the Unified Communication and Collaboration (UCC) Dashboard.

UCC Settings in AMP Setup

Three new UCC settings have been added to the AMP Setup page in the AirWave WebUI.

- **UCC Call History**: Located in **AMP Setup > General > Historical Data Retention**, this setting lets you configure the number if days that calls remain in AirWave's call history. This is set to two days be default.
- **UCC Call Details**: Located in **AMP Setup > General > Historical Data Retention**, this setting lets you configure the number if days that the AirWave retains details for individual calls. This is set to 30 days by default.
- **Enable UCC Calls Stitching (Heuristics)**: Located in **AMP Setup > General > Additional AMP Services**, this setting enables or disables caller-to-callee call stitching for non-SDN deployments. This feature is enabled by default. This should be disabled for NAT and BOC deployments.

UCC Dashboard Tabs

Two new tabs have been added to the graphs and tables on the UCC dashboard.

- **Call Quality > Folders**: This table lists all folders that carried calls and, for each folder, lists the percentage of calls that were rated as poor by UCC.
- **Quality Correlation > Connectivity**: This table lists the number of calls of each quality level (Good, Fair, Poor, and Unknown) by connectivity type (Wi-Fi Conference, Wi-Fi to External, and Wi-Fi to Wi-Fi).

UCC Dashboard Filtering

Two drop-down menus have been added to the top-right of the UCC dashboard to provide a way to filter the UCC information presented by the graphs and tables.

- **WLAN or End-to-End**: This drop-down menu includes two options, WLAN and End-to-End. End-to-End is the default setting. When End-to-End is selected, quality information displayed on the dashboard is based on the end-to-end quality of the calls. If WLAN is selected, information displayed is based on the UCC score of the calls. Note that if end-to-end quality information is not available and heuristics is enabled, then WLAN is selected by default.
- **Voice or Other**: This drop-down allows you to filter the information displayed on the dashboard by voice calls or other types of calls. Voice is any voice-only calls, including voice conference calls. Other is any other type of call, such as video, desktop sharing, etc. This options is available to help reduce the amount calls that appear as unknown on the UCC dashboard.

UCC Call Details

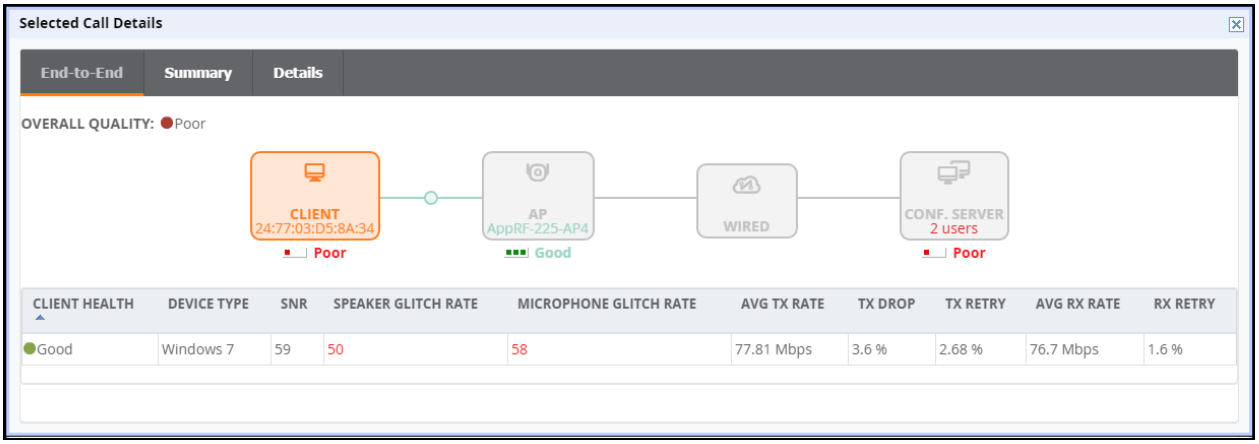
The following new columns have been added to the **Call Details** table found under **Home > UCC > Call Quality > Call Details**:

- **Peer Client**: This field lists client receiving the call if that information is available. If the call type is a conference call, this field is left blank.
- **Device Type**: This field displays the operating system of the client device as a description of the device.
- **Protocol**: The protocol used to complete the call, such as Skype for Business.
- **Connectivity Type**: The method used to facilitate the call, such as Wi-Fi.
- **End-to-End Quality**: This metric is determined by the mean opinion score (MOS) and any device issues that are detected during the call.

Lync End-to-End Visibility

The Lync End-to-End Visibility features gives the network administrator overall view of a specific call. To view a specific call, navigate to **Home > UCC > Call Quality > Call Details** and click the magnifying glass icon in the **Details** column. This opens up the window shown in Figure 17.

Figure 17: *Client Detail (End-to-End View)*



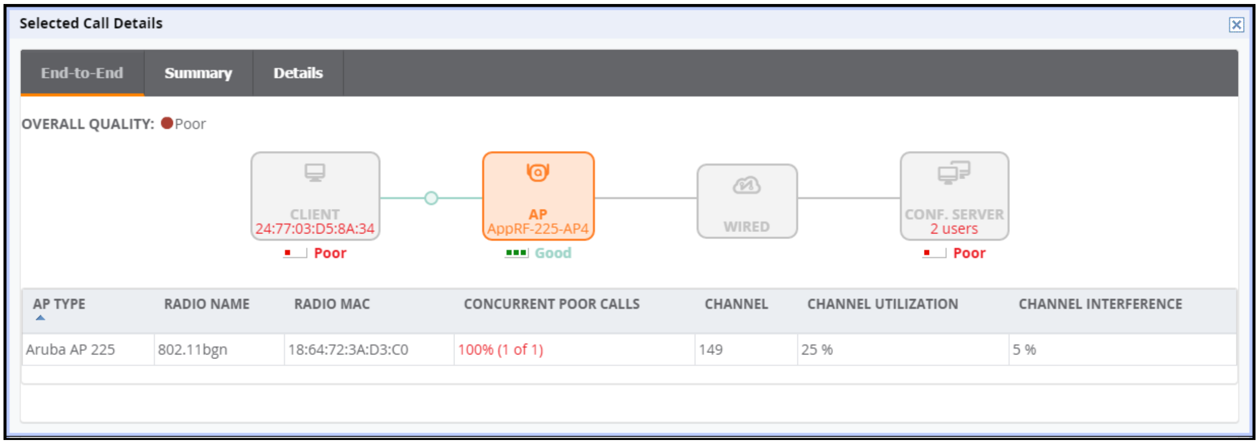
OVERALL QUALITY: ● Poor

CLIENT HEALTH	DEVICE TYPE	SNR	SPEAKER GLITCH RATE	MICROPHONE GLITCH RATE	AVG TX RATE	TX DROP	TX RETRY	AVG RX RATE	RX RETRY
● Good	Windows 7	59	50	58	77.81 Mbps	3.6 %	2.68 %	76.7 Mbps	1.6 %

Table 10: *Client Details*

Metric	Description
Overall Quality	Overall quality is displayed as Good, Fair, or Poor. The quality is determined using the calls UCC Score, a proprietary Aruba metric. ● Good: score of 71 or greater ● Fair: score of 31 to 70 ● Poor: score of 0 to 30 For more information on the UCC Score, see the *AirWave User Guide*.
Client Health	The client health metric compares the actual airtime the AP spends transmitting data is equal to the ideal amount of time required to send data to the client. A client health metric of 50% means the AP is taking twice as long as is ideal, or is sending one extra transmission to that client for every packet. A metric of 25% means the AP is taking four times longer than the ideal transmission time, or sending 3 extra transmissions to that client for every packet.
Device Type	A description of the client device. In the example above, the device is identified by it's operating system; in this case, Windows 7.
SNR	The signal-to-noise ration for the call on the client's connection.
Speaker Glitch Rate	The average number of speaker glitches per five minutes.
Microphone Glitch Rate	Average number of microphone glitches per five minutes.
Avg TX Rate	Displays the average transmission rate of the call in Mbps
Tx Drop	Displays the transmission packet drop in percentage.
Tx Retry	Displays the transmission retry in percentage.
Avg Rx Rate	Displays the average receive rate of the call in Mbps
Rx Retry	Displays the receive retry in percentage.

Figure 18: *AP Details (End-to-End View)*



OVERALL QUALITY: ● Poor

AP TYPE	RADIO NAME	RADIO MAC	CONCURRENT POOR CALLS	CHANNEL	CHANNEL UTILIZATION	CHANNEL INTERFERENCE
Aruba AP 225	802.11bgn	18:64:72:3A:D3:C0	100% (1 of 1)	149	25 %	5 %

Table 11: *AP Details*

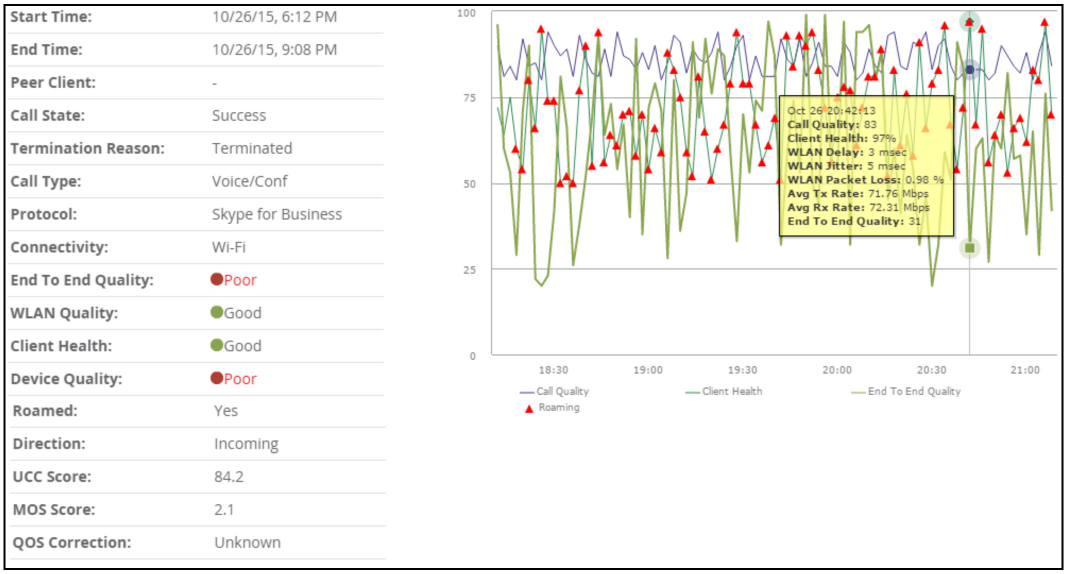
Column Name	Description
AP Type	The type of AP to which the client is connected.

Table 11: *AP Details (Continued)*

Column Name	Description
Radio Name	The AP's radio being used for the call (802.11bgn or 802.11ac)
Radio MAC	The AP radio's MAC address.
Concurrent Poor Calls	The number of poor calls occurring simultaneously with the call being viewed.
Channel	The channel used for the call.
Channel Utilization	The used channel's utilization as a percentage.
Channel Interference	The interference impacting the used channel as a percentage.

The **Summary** tab provides a more detailed view of the call than the **End-to-End** tab. Much of the information from the **End-to-End** tab is repeated but on this tab it is supplemented with a graph displaying the quality of the call as it progressed. Mousing over the graph displays a pop-up that provides a snap-shot of the call at two-minute intervals, which can help identify when changes occurred during the call.

Figure 19: *Call Summary Information*



Start Time:	10/26/15, 6:12 PM
End Time:	10/26/15, 9:08 PM
Peer Client:	-
Call State:	Success
Termination Reason:	Terminated
Call Type:	Voice/Conf
Protocol:	Skype for Business
Connectivity:	Wi-Fi
End To End Quality:	● Poor
WLAN Quality:	● Good
Client Health:	● Good
Device Quality:	● Poor
Roamed:	Yes
Direction:	Incoming
UCC Score:	84.2
MOS Score:	2.1
QOS Correction:	Unknown

Oct 26 20:42:13
Call Quality: 83
Client Health: 97%
WLAN Delay: 3 msec
WLAN Jitter: 5 msec
WLAN Packet Loss: 0.98 %
Avg Tx Rate: 71.76 Mbps
Avg Rx Rate: 72.31 Mbps
End To End Quality: 31

At the bottom of the Summary tab, there is a link titled **More**. Clicking this link reveals additional tables that capture more details that can help provide an overall view of many details of the call.

- **Microphone Details** provides information about the client's microphone, such as manufacturer and model, the capture device driver, glitch rate, and audio microphone error.
- **WLAN** repeats some of the information provided on the End-to-End tab but also includes details about WLAN delay, jitter, and packet loss.
- **End To End** provides details about connection between the caller and receiver as it relates the call. This includes information such as MOS, delay, jitter, packet loss, and burst gap details.
- **End Point Details** provides information about the device used by the caller, such as IP address, Wi-Fi device driver, CPU details, and OS.
- **Speaker Details** describes the speaker used by the caller.

The Details Tab provides much of the same information as the graph and tables on the Summary tab but on single table and broken up into two-minute intervals. This provides another more granular look at the call in question.

Using the UCC Report

The UCC report provides an overall look at UCC activity on your network in the specified time period. This information is displayed in a series of tables representing the top connectivity types, call types, application types, device types, folders, APs, and clients with the highest percentage of poor quality calls.

Table 12: *UCC Report Fields*

Field	Description
Quality Metric	The metric used to determine the quality of calls.
Connectivity Type	The type of connection (such as Wi-Fi to Wi-Fi or Wi-Fi to external) used to complete calls.
Call Type	The type of call, such as voice or video.
Application Type	The software application used to complete a call.
Device Type	The client device used to complete a call. The device type is displayed as the device's operating system.
% of Poor Calls	The percentage of poor calls completed on the specified metric such as device type, application type, etc.
Poor Calls	The number of poor calls completed on the specified metric such as device type, application type, etc.
Total Calls	The total number of calls completed on the specified metric such as device type, application type, etc.
Folders	The device folder from which calls were completed.
APs	The APs that carried calls.
Clients	The clients who completed calls. This is displayed by MAC address and username.
% of Poor Calls by MOS Score	The percentage of poor calls completed by a folder, AP, or client based on the MOS Score.
% of Poor Calls by UCC Score	The percentage of poor calls completed by a folder, AP, or client based on the UCC Score.
Average Client Health (Poor Calls)	The average client health when completing a call.
Total Calls	Total number of calls from a folder, AP, or client.
Total Call Time	Total call time of all calls from a folder, AP, or client.

Aruba Switch Configuration Through AirWave

AirWave 8.2 introduces smart template configuration support for multiple models of Aruba switches when these devices are running ArubaOS-Switch Version 16.01. Table 13 lists supported switches that include support for template configuration via AirWave.

Table 13: *Aruba Switches (Validated to ArubaOS-Switch Version 16.01)*

Device	Monitoring Support	Firmware Changes	Show Commands On Monitor page	Template Configuration	Stacking Monitoring and Configuration
Aruba 2530YA	Yes	Yes	Yes	Yes	No
Aruba 2530YB			Yes	Yes	No
Aruba 2620			Yes	Yes	No
Aruba 2920			Yes	Yes	Yes
Aruba 3800			Yes	Yes	Yes
Aruba 3810			Yes	Yes	Yes
Aruba 5400R			Yes	Yes	Yes

Delta Configuration Push

You can use AirWave template configuration to set or modify individual settings in the configuration profiles listed in Table 14. When you modify any of these profiles on an Aruba switch that supports template configuration, AirWave does not push a complete configuration file. Instead, AirWave pushes a set of configuration changes, called a delta configuration, to the switch without requiring a reboot.

NOTE

Template configuration for Aruba switches is a beta feature in AirWave 8.2, and may be modified in future versions of AirWave.

To set or modify other configuration settings that are not associated with these profiles, you must define a complete switch configuration within the template, then push that entire configuration to the switch. In this instance, all configuration settings are overwritten, and *the switch must reboot to apply those settings.*

Table 14: *Profiles Individually Supported by Template Config*

Profiles	Configuration Examples

Telnet, SSH access	`Switch(config)# telnet-server`
	`Switch(config)# ip ssh`
	`Switch(config)# no ip ssh`
	`Switch(config)# no telnet-server`

ACLs for Telnet/SSH access	`Switch(config)# console inactivity-timer 5`
	`Switch(config)# ip authorized-managers 10.28.227.101 255.255.255.0 access manager`

Banner	`Switch(config)# banner motd %` **NOTE:** % is the delimiter
Port/Trunk Configuration	`Switch(config)# trunk 1/23-1/24 trk1`

VLAN Configuration	`Switch#config`
	`Switch(config)# vlan 200`
	`Switch(vlan-200)# name Datapath`
	`Switch(vlan-200)# untagged 1/22`

Table 14: *Profiles Individually Supported by Template Config (Continued)*

Profiles	Configuration Examples
SNMP	Switch(config)# snmp-server community <community_name> restricted Switch(config)# snmp-server contact < contact-info> Switch(config)# snmp-server location <location-info> Switch(config)# snmp-server community "hp-read" operator Switch(config)# snmp-server community “hp-write" unrestricted Switch(config)# snmp-server host x.x.x.x community "lab" trap-level all
Syslog	Switch(config)# logging <syslog IP server address>
Layer-3 VLAN Interface Configuration	Switch(config)# vlan 200 Switch(vlan-200)# ip address 10.200.200.10 255.255.255.0
MSTP and RPVST Configuration	Switch(config)#spanning-tree 1-44 admin-edge-port Switch(config)#spanning-tree bpdu-protection-timeout 3600
DLDP and UDLD Configuration	Switch(config)# dldp enable Switch(config)#interface al link-keepalive
LLDP Configuration	Switch(config)# lldp refresh-interval <5-32768>
POE Configuration	Switch(config)# lldp refresh-interval <5-32768>
Port Mirroring Configuration	Switch(config)# mirror-port 2
QOS Configuration	Switch(config)# show qos queue-config
802.1X authentication settings (including MAC, web, RADIUS, and Local MAC, and Captive Portal)	Switch(config)# radius-server host 10.200.0.32 key HPE-Aruba Switch(config)# aaa authentication captive-portal

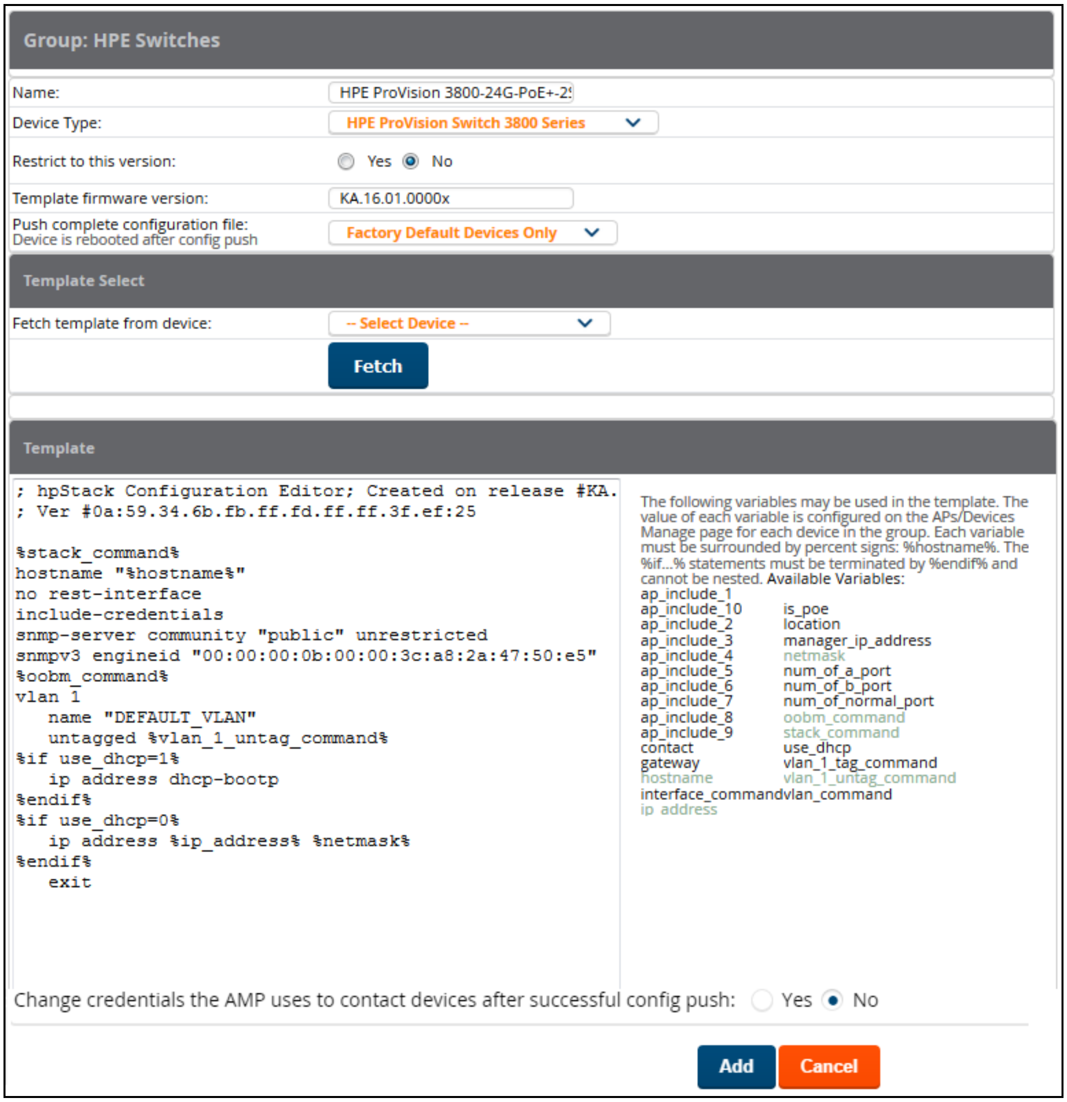
Viewing and Adding Templates

The following set of tasks describes the procedure to view and add variables to a template. For more information about template configuration, see the *AirWave User Guide*.

1. Navigate the **Groups > List**, and select a group to which you will add or edit templates. Create a new group by clicking the **Add** button, or edit an existing group by selecting the corresponding pencil icon. The **Groups > Basic** page for that group appears.
2. From the AirWave navigation pane, select **Templates**. The **Templates** page appears.
3. To create a new template and add it to the AirWave template inventory, navigate to **Groups > List**, and select the group name. The **Details** page appears.
4. Select **Templates**, and then **Add**.
5. Add template details and variables to complete the configurations, as illustrated in Figure 20
6. (Optional) Click the **Push complete configuration file** drop-down list and define the configuration push settings for the device by selecting one of three options:

- **Yes:** Select this option to push complete configuration to devices using that template. The device will reboot after the push.
- **No**: Push only a partial configuration to the devices. A reboot is not required for this option.
- **Factory Default Devices only:** Use a complete configuration push only for factory default devices added via the Zero-Touch Provisioning (ZTP) process. A factory default device will reboot after the push. All other devices will use partial configuration push, which doesn't require a reboot. This is the default option.

Figure 20: *Groups > Templates*



Group: HPE Switches

Name:	HPE ProVision 3800-24G-PoE+-2!
Device Type:	HPE ProVision Switch 3800 Series
Restrict to this version:	○ Yes ● No
Template firmware version:	KA.16.01.0000x
Push complete configuration file: Device is rebooted after config push	Factory Default Devices Only

Template Select

Fetch template from device:	-- Select Device --

Template

```
; hpStack Configuration Editor; Created on release #KA.
; Ver #0a:59.34.6b.fb.ff.fd.ff.ff.3f.ef:25

%stack_command%
hostname "%hostname%"
no rest-interface
include-credentials
snmp-server community "public" unrestricted
snmpv3 engineid "00:00:00:0b:00:00:3c:a8:2a:47:50:e5"
%oobm_command%
vlan 1
   name "DEFAULT_VLAN"
   untagged %vlan_1_untag_command%
%if use_dhcp=1%
   ip address dhcp-bootp
%endif%
%if use_dhcp=0%
   ip address %ip_address% %netmask%
%endif%
   exit
```

The following variables may be used in the template. The value of each variable is configured on the APs/Devices Manage page for each device in the group. Each variable must be surrounded by percent signs: %hostname%. The %if...% statements must be terminated by %endif% and cannot be nested. Available Variables:

```
ap_include_1
ap_include_10       is_poe
ap_include_2        location
ap_include_3        manager_ip_address
ap_include_4        netmask
ap_include_5        num_of_a_port
ap_include_6        num_of_b_port
ap_include_7        num_of_normal_port
ap_include_8        oobm_command
ap_include_9        stack_command
contact             use_dhcp
gateway             vlan_1_tag_command
hostname            vlan_1_untag_command
interface_commandvlan_command
ip_address
```

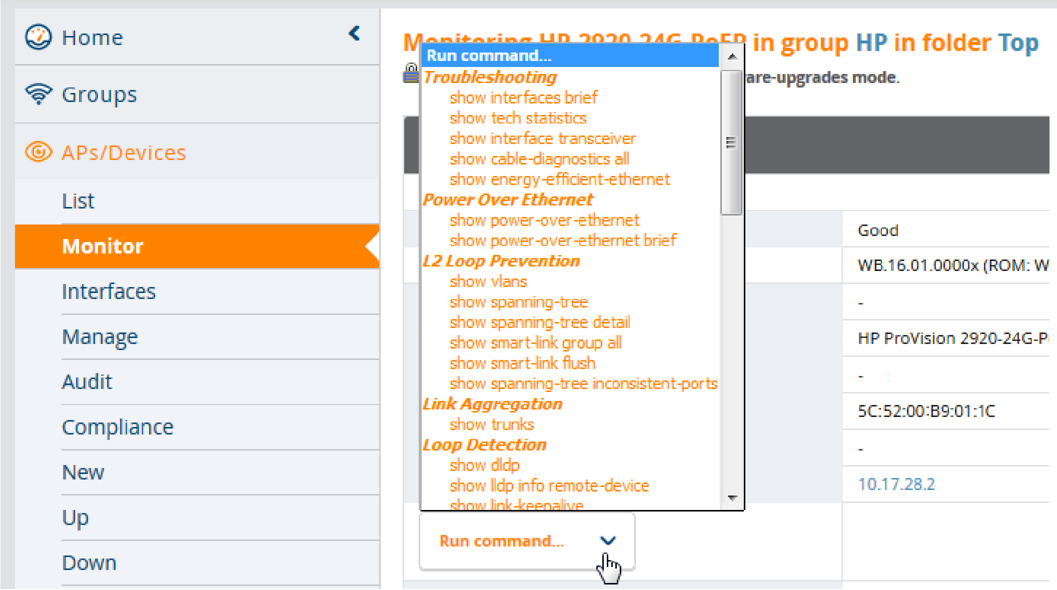
Change credentials the AMP uses to contact devices after successful config push: ○ Yes ● No

Device Monitoring

AirWave allows you to execute show commands on some models of Aruba switches by clicking the **Run Command** drop-down list on the **APs/Devices > Monitor** page of the AirWave WebUI, and selecting a supported show command. (See Figure 21.)

For a list of devices that support show commands via the AirWave **APs/Devices > Monitor** page, refer to the AirWave *Supported Infrastructure Devices* document. For complete information about the output of each command, refer to the documentation for that switch.

Figure 21: *Show Commands on an Aruba Switch*



Zero Touch Provisioning

Zero Touch Provisioning (ZTP) for Aruba switches is delivered through AirWave via a DHCP server. The following sections describe the procedure to provision an Aruba switch using ZTP.

NOTE

Some Aruba switches support commands that allow you to view current AirWave settings or manually configure that switch to associate to an AirWave server via the switch command line interface. For details on these switch commands (including **amp-server** and **show amp)**, refer to the documentation for that switch.

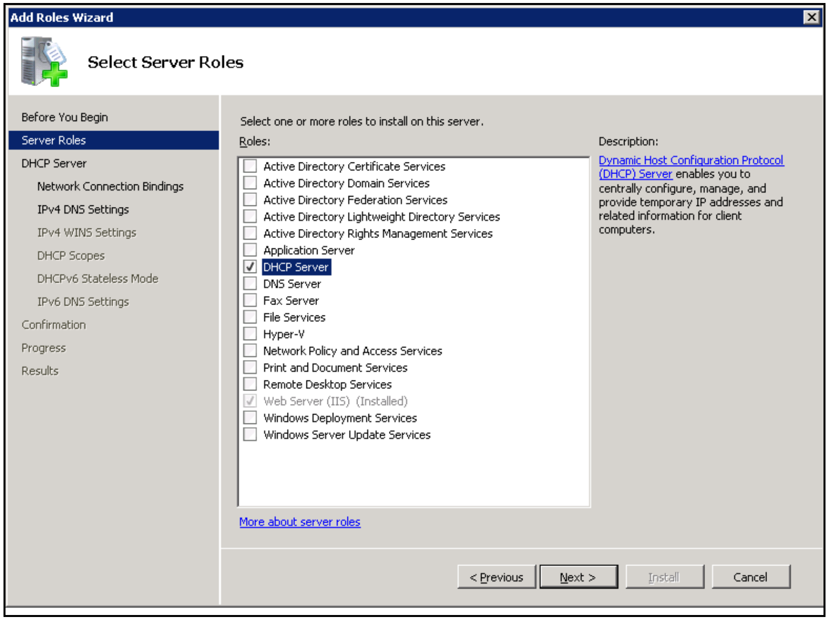
Configuring the DHCP Server

The DHCP discovery must include a DHCP option 60 (Vendor class identifier) to identify the product brand and model, as well as DHCP option 43 (Vendor specific information).

Use the **Add Roles** wizard on your Windows Server 2008 server to complete the following procedure:

1. Add a DHCP server role.
2. From the Add Roles Wizard window, select **Server Roles** > **DHCP Server**.

Figure 22: *Add Roles Wizard (Windows Server 2008)*



Add Roles Wizard

Select Server Roles

- Before You Begin
- Server Roles
- DHCP Server
  - Network Connection Bindings
  - IPv4 DNS Settings
  - IPv4 WINS Settings
  - DHCP Scopes
  - DHCPv6 Stateless Mode
  - IPv6 DNS Settings
- Confirmation
- Progress
- Results

Select one or more roles to install on this server.

Roles:

- ☐ Active Directory Certificate Services
- ☐ Active Directory Domain Services
- ☐ Active Directory Federation Services
- ☐ Active Directory Lightweight Directory Services
- ☐ Active Directory Rights Management Services
- ☐ Application Server
- ☑ DHCP Server
- ☐ DNS Server
- ☐ Fax Server
- ☐ File Services
- ☐ Hyper-V
- ☐ Network Policy and Access Services
- ☐ Print and Document Services
- ☐ Remote Desktop Services
- ☑ Web Server (IIS) (Installed)
- ☐ Windows Deployment Services
- ☐ Windows Server Update Services

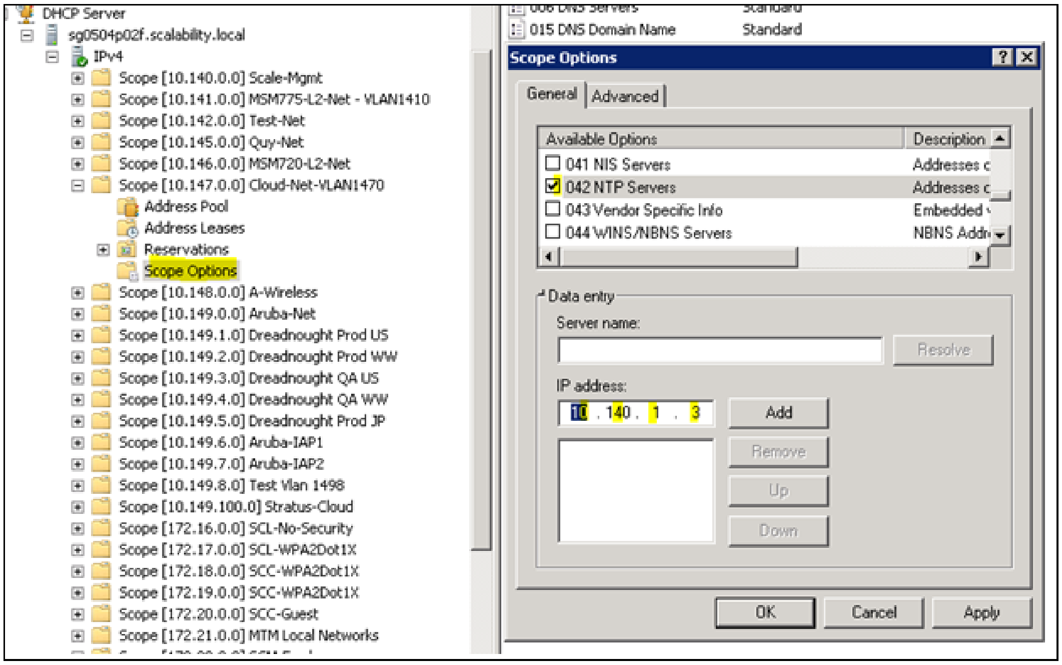
Description:

Dynamic Host Configuration Protocol (DHCP) Server enables you to centrally configure, manage, and provide temporary IP addresses and related information for client computers.

More about server roles

3. Click **Next**.
4. From the Server Manager window, select **Roles > DHCP Server > the desired domain DHCP Server > IPv4**.
5. Right click **Scope Options** and select **Configure Options**.

Figure 23: *Windows 2008 Scope Options*



- DHCP Server
  - sg0504p02f.scalability.local
    - IPv4
      - Scope [10.140.0.0] Scale-Mgmt
      - Scope [10.141.0.0] MSM775-L2-Net - VLAN1410
      - Scope [10.142.0.0] Test-Net
      - Scope [10.145.0.0] Quy-Net
      - Scope [10.146.0.0] MSM720-L2-Net
      - Scope [10.147.0.0] Cloud-Net-VLAN1470
        - Address Pool
        - Address Leases
        - Reservations
        - Scope Options
      - Scope [10.148.0.0] A-Wireless
      - Scope [10.149.0.0] Aruba-Net
      - Scope [10.149.1.0] Dreadnought Prod US
      - Scope [10.149.2.0] Dreadnought Prod WW
      - Scope [10.149.3.0] Dreadnought QA US
      - Scope [10.149.4.0] Dreadnought QA WW
      - Scope [10.149.5.0] Dreadnought Prod JP
      - Scope [10.149.6.0] Aruba-IAP1
      - Scope [10.149.7.0] Aruba-IAP2
      - Scope [10.149.8.0] Test Vlan 1498
      - Scope [10.149.100.0] Stratus-Cloud
      - Scope [172.16.0.0] SCL-No-Security
      - Scope [172.17.0.0] SCL-WPA2Dot1X
      - Scope [172.18.0.0] SCC-WPA2Dot1X
      - Scope [172.19.0.0] SCC-WPA2Dot1X
      - Scope [172.20.0.0] SCC-Guest
      - Scope [172.21.0.0] MTM Local Networks

006 DNS Servers Standard

015 DNS Domain Name Standard

Scope Options

Available Options	Description
☐ 041 NIS Servers	Addresses c
☑ 042 NTP Servers	Addresses c
☐ 043 Vendor Specific Info	Embedded v
☐ 044 WINS/NBNS Servers	NBNS Addr

Data entry

Server name:

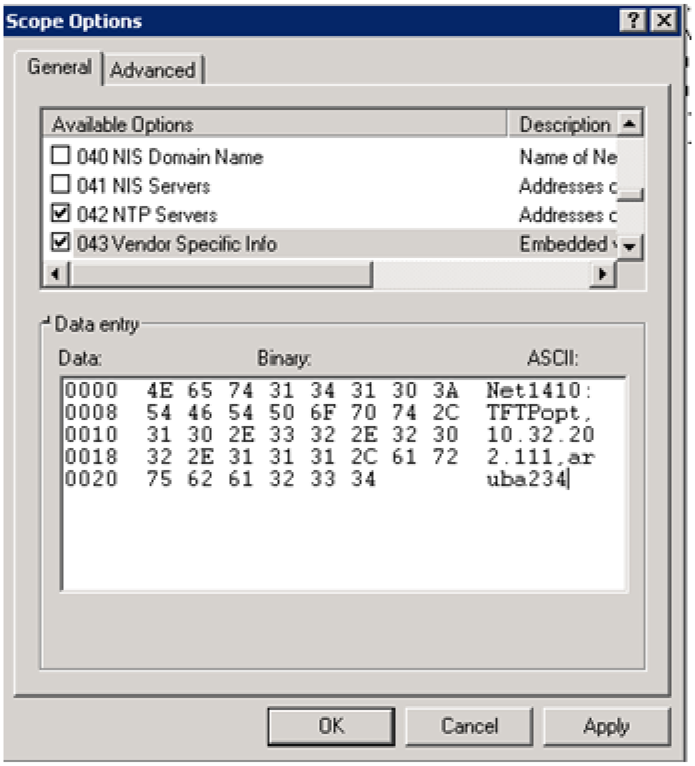
IP address: 10 . 140 . 1 . 3

6. Select option **042 NTP Servers** and specify the IP address of the NTP Servers.
7. Click Add.
8. Right click **Scope Options** again and select **Configure Options**.
9. Select option **043 Vendor Specific Info** and specify the following AirWave configuration parameters in the **ASCII** field.

```
<Group>:<Topfolder>:<folder1>,<AMP IP>,<shared secret>
```

For example, **Net1410;TFTPopt:10.32.202.111,aruba234**

Figure 24: *Vendor-Specific Scope Options*



Available Options	Description
☐ 040 NIS Domain Name	Name of Ne
☐ 041 NIS Servers	Addresses c
☑ 042 NTP Servers	Addresses c
☑ 043 Vendor Specific Info	Embedded v

Data entry

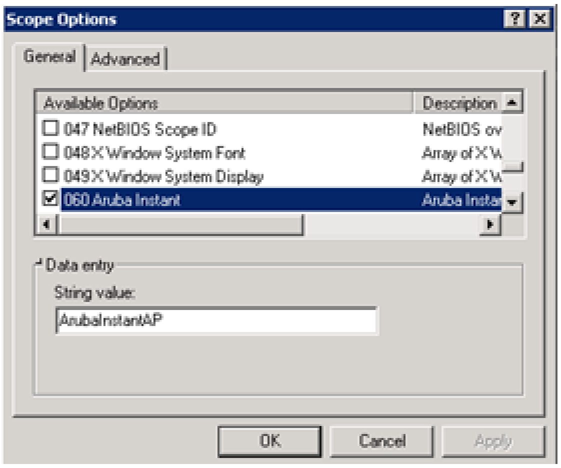
```
Data:    Binary:                    ASCII:
0000  4E 65 74 31 34 31 30 3A   Net1410:
0008  54 46 54 50 6F 70 74 2C   TFTPopt,
0010  31 30 2E 33 32 2E 32 30   10.32.20
0018  32 2E 31 31 31 2C 61 72   2.111,ar
0020  75 62 61 32 33 34         uba234
```

10. Click OK.

11. Right click **Scope Options** again and select **Configure Options**.

12. Select option **060** and enter the value **ArubaInstantAP** in the **String Value** field.

Figure 25: *Configuring DHCP Option 60*



Available Options	Description
☐ 047 NetBIOS Scope ID	NetBIOS ov
☐ 048 X Window System Font	Array of X W
☐ 049 X Window System Display	Array of X W
☑ 060 Aruba Instant	Aruba Insta

Data entry

String value: ArubaInstantAP

13. Click **OK**.

Configuring AirWave for ZTP

To configure AirWave to support ZTP for Aruba switches, complete the following procedure:

1. Add the first device to create the initial configuration (golden configuration). You can do this via DHCP or add the device manually by issuing the command **amp-server ip <ip_addr> group <group_name> folder <folder_name> secret <shared_secret>** on the switch.

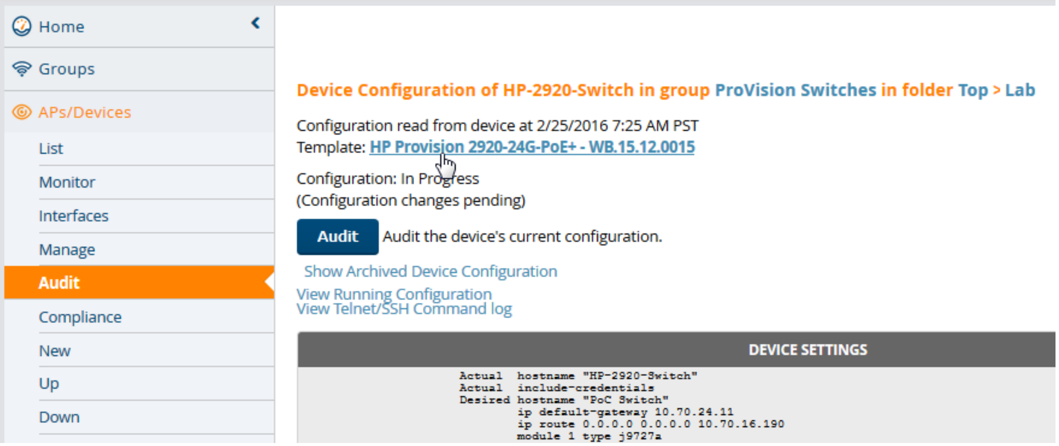
2. Once the device state is UP on AirWave, navigate to **APs/Device > Manage > Device Communication**, enter the Telnet/SSH username and password, then confirm the password.

NOTE

Before proceeding, verify that your configuration is in a good state.

3. Select the first device in the **APs/Devices > List page**.
4. Navigate to the **APs/Devices > Audit** page for that device.
5. Click the link to the device template on that page to open the **Groups > Templates** page.

Figure 26: *Selecting the Device Template*



Device Configuration of HP-2920-Switch in group ProVision Switches in folder Top > Lab

Configuration read from device at 2/25/2016 7:25 AM PST
Template: HP Provision 2920-24G-PoE+ - WB.15.12.0015

Configuration: In Progress
(Configuration changes pending)

Audit — Audit the device's current configuration.

Show Archived Device Configuration
View Running Configuration
View Telnet/SSH Command log

DEVICE SETTINGS

```
Actual  hostname "HP-2920-Switch"
Actual  include-credentials
Desired hostname "PoC Switch"
        ip default-gateway 10.70.24.11
        ip route 0.0.0.0 0.0.0.0 10.70.16.190
        module 1 type j9727a
```

6. In the **Groups > Templates** page, scroll down to the **Credentials** table.
7. In the **Change credentials AMP uses to contact devices after successful config push** field, select **Yes**.
8. (Optional) Enter a new Telnet/SSH username and password to change the credentials AirWave uses to contact the devices.
9. Navigate to **AMP Setup> General > Automatic Authorization**.
10. In the **Automatically Authorized Switch Mode** field, select the **Manage Read/Write** option.
11.When you power on additional factory-default devices that match the same group and shared secret as the "golden config" device, those devices are automatically authorized, and receive their configuration information. The devices then reboot and up comes back up with a good configuration state.

Improved CAD Import

AirWave 8.2 introduces an enhancement to the importation of CAD (.dwg) files. When importing a CAD file to VisualRF, you are now given the option to define CAD layers as walls on your floor plan.

Beginning in 8.2, after uploading a CAD file, there is a new step on the Define New Floor page called CAD Layer. VisualRF generates a list of the layers in the uploaded CAD file. Any of the layer can then be defined as walls on the floorplan.

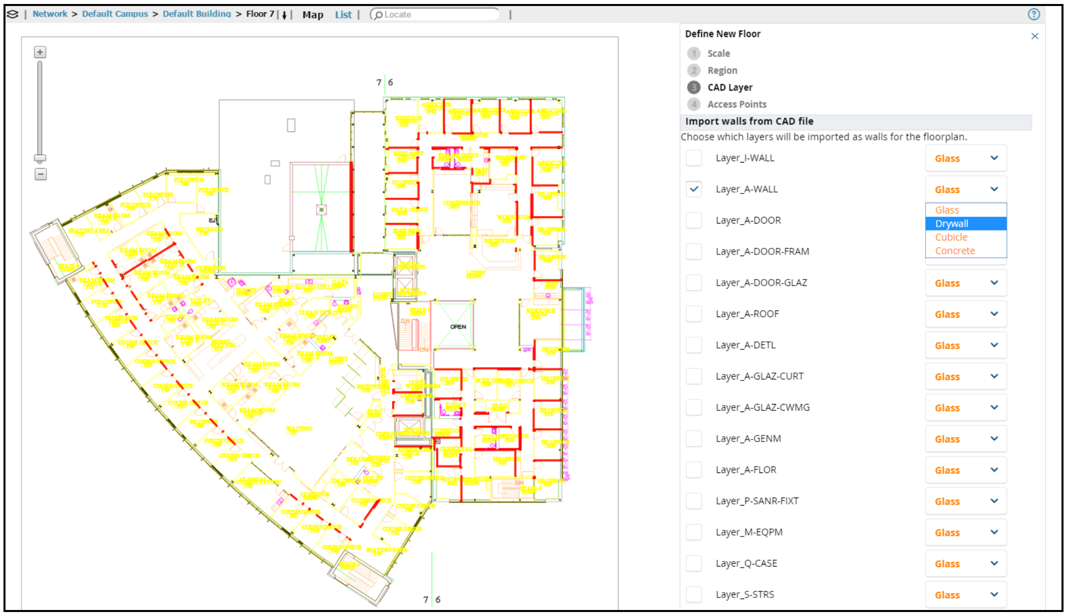
To define a layer as walls, complete the following steps:

1. Check the checkbox to the left of the layer name to define it as walls.
2. Select the type of wall using the options in the drop-down list to the right of the layer name.
3. Click Next to continue defining the floor plan

NOTE

Each floor plan is limited to 200 walls.

Figure 27: *CAD Layer - VisualRF*



Define New Floor

1 Scale
2 Region
3 CAD Layer
4 Access Points

Import walls from CAD file

Choose which layers will be imported as walls for the floorplan.

□	Layer_I-WALL	Glass
☑	Layer_A-WALL	Glass Glass Drywall Cubicle Concrete
□	Layer_A-DOOR	
□	Layer_A-DOOR-FRAM	
□	Layer_A-DOOR-GLAZ	Glass
□	Layer_A-ROOF	Glass
□	Layer_A-DETL	Glass
□	Layer_A-GLAZ-CURT	Glass
□	Layer_A-GLAZ-CWMG	Glass
□	Layer_A-GENM	Glass
□	Layer_A-FLOR	Glass
□	Layer_P-SANR-FIXT	Glass
□	Layer_M-EQPM	Glass
□	Layer_Q-CASE	Glass
□	Layer_S-STRS	Glass

Aruba Controller Configuration Enhancements

The following additions have been made to AirWave's controller configuration options to support ArubaOS6.4.3.1. See the latest ArubaOS User Guide and CLI Guide for more information about each of these new fields.

- **ARM Profile**: **Client Match 11v BSS Transition Management** enables client match using 802.11v BSS Transition Management; this value is enabled by default. **Client Match IOS Steer Backoff Interval** sets the backoff interval (in seconds) between IOS steering attempts.
- **IKE Profile** and **Site to Site IKE Profile**: Support added for **Configure Hex Key** and **Disable IP COMP**(Site to Site IKE only) under **Advanced Services > VPN Services > Site to Site IKE** for controllers running ArubaOS 6.4.3.0 and later.
- **Virtual AP Profile**: Supported added for **WAN Operation** under the **Virtual AP Profile**. This specifies the wan-operation to enable Virtual AP depending on the state of the WAN link. The default value is always but can be changed to backup or primary.
- **AAA Profile**: Support added for **Open SSID Radius Accounting** and **Max IPv4 for Wireless User**. **Open SSID Radius Accounting** initiates RADIUS accounting as soon as the user associates to an Open SSID without any authentication; disabled by default. **Max IPv4 for Wireless User** specifies the number of IPv4 addresses that can be associated to single wireless user; the deafult value is two (2).
- **Web SSH Management Profile**: The following fields have been added to the Web SSH Management profile page.
  - **Bypass Captive Portal Landing Page**: if disabled, the controller uses the new redirection scheme also known as the landing page by default including the meta tag. This can reduce the CPU load on the controller. The controller falls back to the old redirection scheme if this parameter is enabled. Disabled by default.
  - **Configure Lync Listen Port Access**: Configures the port number on which the Skype4B plug-in sends HTTP/HTTPS messages to the Aruba controller.
  - **TLS Protocol, TLS Protocol 1.1**, **TLS Protocol 1.2**: Enables the TLS protocol version.
  - **IDP Certificate**: Specifies the IDP certificate name configured in the controller.
- **Session Access List**: web-cc-category and web-cc-reputation are now supported services types.

- **IPSEC Transform Set Profile**: GCM encryption does not support hash algorithms from ArubaOS 6.4.3.1 or later.
- **AP System Profile**: The **GRE Striping IP** field has been removed from the **AP System Profile**.
- **Netservice Profile**: Fields for **http-proxy** and **https-proxy** have been added to the **Netservice Profile** to configure the application access level.
- **Management Config**: New options have been added to the **Management Config** profile to **Disable Inline DHCP Stats**, **Disable Inline AP Stats**, **Disable Inline Auth Stats**, and **Disable Inline DNS Stats**. These options are set to **No** by default.

VisualRF UI Changes

The AirWave 8.2 VisualRF feature only supports the HTML5-based UI. AirWave 8.2 has deprecated the **Enable HTML5-based UI** setting added to the **VisualRF > Setup > Server Settings** page in AirWave 8.0, removing the option to toggle between the legacy flash-based UI and the newer HTML5 UI.

The legacy flash-based VisualRF UI allowed users to add a wiring closet to a floor plan or create a client survey. If you created a wiring closet or client survey in a previous release, this information is still be displayed in AirWave 8.2, but cannot be modified.

AirWave provides a range of features to manage network infrastructure devices from Aruba Networks and other vendors. AirWave 8.2.1 introduces support for the following Aruba and Hewlett Packard Enterprise products.

For a complete list of supported products from other vendors, see the *AirWave 8.2 Supported Infrastructure Devices* document. You can find this document at support.arubanetworks.com.

Support for New Devices in AirWave 8.2.1

This release of AirWave supports the following new devices

Aruba 7008 Controller

AirWave 8.2.1 introduces support for the Aruba 7008 controller.

Aruba Access Points

AirWave 8.2.1 introduces support for the Aruba AP-330 Series and AP-310 Series access points.

Aruba 2930F Switch

AirWave 8.2.1 introduces support for the Aruba 2930F switch.

Cisco 3800AP Switch

AirWave 8.2.1 introduces support for the Cisco 3800AP switch.

New Devices in AirWave 8.2.0

AirWave introduces support for the following wireless access points, switches and access point module:

- AP-314, AP-315, AP-324, AP-325, AP-334, AP-335 Aruba access points
- IAP-324, IAP-325, ; Aruba Instant access points 4.2.4 (template configuration only)
- Aruba 2530YA switch*
- Aruba 2530YB switch*
- Aruba 2620 switch*
- Aruba 2920 switch
- Aruba 3800 switch
- Aruba 3810 switch
- Aruba 5400R switch
- APM-210 module (for Ericsson RBS 6402)

* These models do not support Zero-Touch Provisioning. Refer to "Known Issues" on page 46 for details.

Instant Support

AirWave 8.2.1 supports Aruba IAPs running Instant 6.4.4.6-4.2.4.0 and prior versions, including the management of configuration settings and software upgrades. The following table shows when each new version of Instant was initially supported in AirWave.

Table 15: *AirWave Support for Instant*

Instant Version	Support for Template Configuration	Support for IGC configuration
Instant 4.2.4	AirWave 8.2.1 and 8.2.0.3*	AirWave 8.2.1, with the Instant 4.2.1 UI
Instant 4.2.3	AirWave 8.2	AirWave 8.2, with the Instant 4.2.1 UI
Instant 4.2.2	AirWave 8.2	AirWave 8.2, with the Instant 4.2.1 UI
Instant 4.2.1	AirWave 8.0.10.0	AirWave 8.0.10.0
Instant 4.2	AirWave 8.0.9	AirWave 8.0.9
Instant 4.1.3.1	AirWave 8.2.1, 8.2.0.3, and 8.0.11.2	AirWave 8.2.1, 8.2.0.3, and 8.0.11.2
Instant 4.1.3	AirWave 8.2.1, 8.2.0.3, and 8.0.11.2	AirWave 8.2.1, 8.2.0.3, and 8.0.11.2
Instant 4.1.2	AirWave 8.0.9	AirWave 8.0.9
Instant 4.1.1	AirWave 8.0.4	AirWave 8.0.4
Instant 4.1	AirWave 8.0	AirWave 8.0.4
Instant 4.0	AirWave 8.0 and AirWave 7.7.10	AirWave 7.7.8
Instant 3.4	AirWave 7.7.3	AirWave 7.7.8
Instant 3.3	AirWave 7.6.4	AirWave 7.7.8
Instant 3.2	AirWave 7.6.1	AirWave 7.7.5
Instant 3.1	AirWave 7.5.6	N/A
Instant 3.0	AirWave 7.5	N/A

*AirWave 8.2.0.3 supports template configuration for Instant 6.4.4.4-4.2.4.0, with the exception of the **wired-port-profile <profile > [no] trusted** command, which must be manually configured using the IAP command-line interface.

Resolved Issues

The following tables list issues resolved in AirWave 8.2.1 and prior releases.

Table 16: *Issues Resolved in AirWave 8.2.1*

ID	Description
DE25427	**Symptom**: A controller does not automatically reboot if a firmware download operation fails. **Scenario**: If the AirWave system boot process detects file copy failures during a firmware upgrade, the reboot process will not initialize, and the switch will not reboot.
DE25735	**Symptom**: AirWave is now able to restore a backup file after an AirWave server upgrades from AirWave 8.0.x to AirWave 8.2.1. **Scenario**: Improvements to how the internal server_watcher_limits file is handled resolve this issue in AirWave 8.2.1.
DE25704	**Symptom**: AirWave 8.2.1 does not create duplicate entries for devices added via Activate if those devices are moved to another group. **Scenario**: When an Mobility Access Switch is added to AirWave 8.2.1 via Activate Zero-Touch Provisioning and then moved into a group other than the group defined via Activate, a duplicate entry for that device no longer reappears in the original AirWave folder specified by Activate.
DE25599	**Symptom**: Planned APs correctly appear on an AirWave 8.2.1 VisualRF floorplan. **Scenario**: An issue was identified in AirWave 8.2 that prevented planned APs from appearing on a floorplan. This issue is resolved in AirWave 8.2.1 by improvements to the parsing of the internal catalog repository that maintains all of the values used by VisualRF.
DE25580 DE25544	**Symptom**: An issue is resolved where Instant APs configured via the Instant GUI Config (IGC) feature could lose a configured PPPOE-password parameter and incorrectly add an additional ACL entry. **Scenario**: This issue occurred when IGC incorrectly identified a mismatch on the device, and attempted to modify the device configuration to resolve that mismatch. Internal changes in AirWave 8.2.1 prevent a mismatch from being incorrectly identified, resolving this issue.
DE25691	**Symptom**: APs placed in a VisualRF floorplan no longer shift location slightly when the page is refreshed. **Scenario**: When APs were placed on a small VisualRF floor plan configured with metric units and a small grid size, rounding errors in internal calculations made the AP change positions slightly when the position was saved to the flooplan. This issue is resolved in AirWave 8.2.1.
DE25623	**Symptom**: An Instant AP image can not be uploaded via an external file server if an image with the same name is already uploaded to the AirWave server. **Scenario**: The **Device Setup >Upload Firmware & Files** page of the AirWave WebUI now supports uploading files via an external file server, even if a file with the same name already exists in the firmware list on the **Groups > Firmware** page.

Table 16: *Issues Resolved in AirWave 8.2.1 (Continued)*

ID	Description
DE25540	**Symptom**: AirWave failed to import Cisco IOS templates from standalone APs. **Scenario**: This issue has been fixed in AirWave 8.2.1.
DE25539	**Symptom**: AirWave 8.2.1 contains OpenSSL security updates for RHSA-2016:0996-2. **Scenario**: Security flaws in OpenSSL could allow an application that is compiled against it to crash, or execute arbitrary code, using the permissions of the user running the application. AirWave 8.2.1 includes enhancement for RHSA-2016:0996-2, which resolves vulnerabilities CVE-2016-2842, CVE-2016-2100, CVE-2016-2108, CVE-2016-2107, CVE-2016-2106, CVE-2016-2105, and CVE-2016-0799.
DE25509	**Symptom**: An issue is resolved where an Instant AP cluster appeared in an error state after upgrading from Instant 4.1.1.13 to Instant 4.1.3. **Scenario**: Changes to how the AirWave Instant GUI Config (IGC) feature handles Instant releases with double digits resolves this issue in AirWave 8.2.1.
DE25472 DE24975	**Symptom** :AirWave 8.2.1 contains OpenSSL security updates for RHSA-2016:0301-1. **Scenario**: Security flaws in OpenSSL allowed side-channel attacks, application crashes, decryption of RSA-encrypted cipher text, or allowed malicious SSLv2 clients to negotiate SSLv2 ciphers that were disabled on the server. AirWave 8.2.1 includes enhancement for RHSA-2016:0301-1, which resolves vulnerabilities CVE-2015-3197, CVE-2016-0702, CVE-2016-0705, CVE-2016-0797 and CVE-2016-0800.
DE25434	**Symptom**: An issue is resolved where a large number of alerts for high CPU or memory usage were incorrectly triggered. **Scenario**: An AirWave trigger configured as "*Device Type is Access Point, Percent CPU Utilization >= 80% or Percent Memory Utilization >= 30% for 1 minutes*" triggered many alerts where the alert type appeared as "deleted" in the **System > Alerts** page. Improvements to CPU utilization processes resolve this issue in AirWave 8.2.1.
DE25421	**Symptom**: Some .dwg files were not correctly uploaded into VisualRF as floorplan images. **Scenario**: Improvements to an internal image converter process resolves an issue where some .dwg images were not getting correctly converted to .svg images in VisualRF.
DE25385	**Symptom**: In previous releases of AirWave, filters applied to limit the display of rogue devices could not be removed all filters at once, but had to be removed individually. **Scenario**: AirWave 8.2.1 resolves this issue with the addition of a new **Reset filters** link on the **RAPIDS > List** page.
DE25382	**Symptom**: The default duration for a support connection is fourteen days in AirWave 8.2.1. In previous versions of AirWave 8.2.x, the default connection period was one day. **Scenario**: A support connection is a point-to-point IP tunnel that is initiated from a customer AirWave server to Aruba's support server. A support connection on a server running AirWave 8.2.1 remains open for seven days, unless it is manually closed using the command **# service support_connection stop**.

Table 16: *Issues Resolved in AirWave 8.2.1 (Continued)*

ID	Description
DE25373	**Symptom**: When running a custom report with the **Uptime by Device** option selected, AirWave reported incorrect uptimes or reported devices as being down although they were running. **Scenario**: This issue has been fixed by improvements to the order in which device uptime records are set.
DE25317	**Symptom**: The **Clients > Diagnostics** page inaccurately reported the channel width when it displayed 120 MHz for very high throughput (VHT) mode. **Scenario**: The channels displayed are now correct for high throughput (HT) and VHT networks. Channels a device can use are: 20, 40, 80, or 160.
DE25282	**Symptom:** An AirWave server running AirWave 8.2.0.x sent random authentication requests to the RADIUS server. **Scenario:** This issue occurred only for RADIUS authentication, where unexpected RADIUS requests were repeatedly sent to the RADIUS server, and continually failed.
DE24713	**Symptom**: Cisco 2700e LWAPP APs did not correctly display heat maps for 802.11ac radios, although heatmaps did correctly display for radios in 'ng' or 'na' modes. **Scenario**: Updates to the internal catalog allows VisualRF to recognize Cisco 2700e LWAPP AP radios in 802.11ac mode.
DE24567	**Symptom**: Previous releases of AirWave 8.x generated two NMS events for the same rogue ID classification if If a trigger is configured to forward an alert to another network management system. **Scenario**: Improvements in AirWave 8.2.1 sends a single detailed alert for an NMS trap, rather than sending one NMS trap with details, and another NMS trap without details.
DE22575	**Symptom**: The **Supported Platforms** column in the interfaces table on the **Groups > Controller Config > Local Config > Network > Port/Interfaces > Gigabit Ethernet** page now correctly lists the Aruba 7205 controller. **Scenario**: In previous releases of AirWave, the 7205 controller was incorrectly omitted as a supported platform for Ethernet interfaces that were supported by that device.

Table 17: *Issues Resolved in AirWave 8.2.0.3*

ID	Description
DE25624	**Symptom**: AirWave did not generate matching event reports for an AP on the **Reports > Detail** page although it had connected clients. **Scenario**: This issue occurred when AirWave skipped AMON messages that didn't contain AP identification information. The method in which AirWave obtains the identification information for an AP has been changed to resolve this issue.
DE25570	**Symptom**: When VisualRF ran calculations to build the campus grid, it generated large amounts of data which resulted in extremely large backups. **Scenario**: As a result of this issue, VisualRF ran out of memory and crashed. Visual RF now runs calculations in smaller intervals.

Table 17: *Issues Resolved in AirWave 8.2.0.3 (Continued)*

ID	Description
DE25448	**Symptom**: Sometimes the Domain Name System (DNS) Resolution graph in the Clarity dashboard wouldn't display. **Scenario**: This graph wouldn't load because of an underlying ArubaOS issue, where the DNS samples field populated when it shouldn't. The mechanism for querying the DNS samples measured has been corrected.
DE25419	**Symptom**: Old JRE files remained after an upgrade. **Scenario**: When upgrading from an earlier version of AirWave, a new JRE installs over itself, leaving JREs from previous installations. You can run a script and select which JRE files to delete. The script is in the /src/x86_64/rpms/Makefile directory.
DE25416	**Symptom**: After upgrading from AirWave 8.0.11.1 to 8.2.x, the Network view in VisualRF displayed incorrect results on the campus map. **Scenario**: AirWave 8.2.0.3 fixes an issue where the data migration of pixel width and height didn't work during an upgrade from 8.0.11.x. Campuses no longer overlay each other on the map, and you can drag and drop, or auto arrange items again.
DE25408	**Symptom**: You could not modify the primary, secondary, or tertiary controllers from the **Cisco Thin AP Settings** or the **Manage Configuration** page. **Scenario**: After upgrading from an earlier version of AirWave to 8.2.0.1, you couldn't make a selection from the drop down menu, or access the drop down menu. These issues are resolved for all web browsers.
DE25352	**Symptom**: In the Usage graph for connected clients, accessed from the **Client > Connection** page, the labels and color codings were incorrect. **Scenario**: The information in these graphs, such as color coding, axis direction, and client traffic direction, were changed to match other Usage graphs in the WebUI.
DE25346	**Symptom**: During an upgrade to AirWave 8.2.x, the system attempted to upgrade the firmware after exceeding the maximum retries limit. **Scenario**: The system now stops the upgrade when it reaches the maximum retries limit.
DE25320	**Symptom:** The row of statistics hyperlinks, called Top Header Stats, displayed incorrectly. **Scenario:**AirWave 8.2.0.3 corrects this screen output issue.
DE25312	**Symptom**: Security flaws in the AirWave 8.0.x release could have caused an application that is compiled against the NSS library to crash, or execute arbitrary code, using the permissions of the user running the application (CVE-2016-1978 and CVE-2016-1979). **Scenario**: AirWave 8.2.0.3 contains the following Linux security updates, which correct these issues: • nss-util security update RHSA-2016:0370-1 • glibc security and bug fix update RHSA-2016:0175-1 • kernel security and bug fix update RHSA-2015:2636-1 • nss, nss-util, and NSPR security update RHSA-2016:0591-1

Table 17: *Issues Resolved in AirWave 8.2.0.3 (Continued)*

ID	Description
DE25310	**Symptom**: AMON messages sent from ArubaOS controllers contain timestamps in various formats. **Scenario**: AirWave 8.2.1 resolves this issue by reporting all messages in the **Clarity** dashboard in milliseconds. In order to view complete Clarity data, upgrade AirWave to 8.2.0.3 and ensure that the controller is running ArubaOS 6.4.3.9, 6.4.4.8, or later.
DE25067	**Symptom**: When you deploy an AP in a floor plan, VisualRF doesn't display a heatmap for the AP unless you restart VisualRF. **Scenario**: VisualRF automatically refreshes and displays a heatmap for APs added to a floor plan.
DE24962	**Symptom**: The **telnet_cmds** log file tracks commands sent between AirWave and a device using Telnet or SSH and might include passwords and secret data. **Scenario**: Security enhancements in AirWave 8.2.1 prevent these files from being viewed using the WebUI and prevent them from being included in an AirWave backup file.

Table 18: *Issues Resolved in AirWave 8.2.0.2*

ID	Description
DE25409 DE25378	**Symptom:** Clients associated to an Instant AP correctly appear in VisualRF. **Scenario:** In previous releases of AirWave 8.2.x, IAP clients did not appear correctly in VisualRF floor plans.
DE25333	**Symptom**: AirWave 8.2.x processed incoming rogue data and didn't update the AP database. correctly. **Scenario**: AirWave stores this rogue AP data and shows rogue devices accurately in the RAPIDs overview pages.
DE25314	**Symptom**: In the **Home** > **Clarity** Monitoring pages of the WebUI, the **AP Name** column in the **AP Summary table** and APs column **of the AP Association** table display the AP name defined by the controller to which that AP is associated. **Scenario**: AirWave displays the correct AP name sent by the controllerin the Clarity monitoring tables and graphs.
DE25260	**Symptom** An issue prevented AirWave 7.7.14 from upgrading to earlier releases of AirWave 8.2.x. **Scenario**: This issue is resolved by changes to the internal installation process that modified the order in which some modules were installed.
DE25429	**Symptom**: The DNS failure graph on the **Home** > **Clarity** pages of the WebUI displayed inaccurate DNS data. **Scenario**: Aruba controllers running ArubaOS 6.4.4.6 sent continuous server timeout errors. As a result, the DNS failure graphs displayed inaccurate data. This issue has been resolved.

Table 18: *Issues Resolved in AirWave 8.2.0.2 (Continued)*

ID	Description
US14749	**Symptom**: The accuracy of Clarity data is improved with a change that allows AirWave to use VLAN IP addresses to validate the source of the AMON messages sent to the AirWave server. **Scenario**: This change resolves an issue that allowed the **Home > Clarity** Monitoring pages to display inaccurate information for the following deployments: ● In a Master+Master-Standby controller deployment with VRRP and LMS IP set on the controller, AMON AP messages were being sent with the LMS IP, preventing AirWave from processing them. ● If messages were sent from the AP use a different VLAN IP than the controller, AirWave would not process them correctly. ● If the IP address used by a single controller VLAN is defined as the IP address by which AirWave communicates with the controller, AP station AMON messages sent from any other VLAN IP defined on the controller would not be processed correctly by AirWave.

Table 19: *Issues Resolved in AirWave 8.2.0.1*

ID	Description
DE25275 DE25251	**Symptom**: An issue is resolved where an AirWave server upgrading to AirWave 8.2.0 might have insufficient disk space issue to allow the upgrade to completing successfully. **Scenario**: This issue is resolved by changes to the internal upgrade procedures in AirWave 8.2.0.1 that reduced the required disk space for the upgrade.
DE23592	**Symptom:** VisualRF correctly saves grid size modifications to floor plans. **Scenario:** AirWave 8.2.0.1 resolves an issue that prevented VisualRF section of the AirWave UI from saving modifications to the floor plan grid size property.

Table 20: *Issues Resolved in AirWave 8.2*

ID	Description
DE23305	**Symptom:** VisualRF floor plans could display floor plan dimensions in feet, even if VisualRF was configured to display metric units. AirWave 8.2 resolves this issue, and floor plan dimensions are correctly converted from imperial to metric measurements. **Scenario:** This issue was observed when VisualRF settings were changed to display dimensions in metric units.

Chapter 6
Known Issues

The tables below lists known issues identified in AirWave 8.2, 8.2.0.2, and 8.2.0.3 releases. There are no known issues in AirWave 8.2.0.1.

Table 21: *Known Issues in AirWave 8.2.1*

ID	Description
DE25926	**Symptom**: 2530YA, 2530YB and 2620 HPE Aruba switches fail to register with AirWave when provisioned via Zero-Touch Provisioning (ZTP) or configuration settings pushed from AirWave to the switch command-line interface. **Scenario**: This issue is triggered by OpenSSL updates in AirWave that caused a compatibility issue with this device.
DE25875	**Symptom**: AirWave displays incorrect transmission power for APs running ArubaOS 6.4.4.0 to 6.4.4.6. **Scenario**: For APs running the impacted versions of ArubaOS, transmission power levels on the **APs/Devices > Monitor** page are displayed as twice the actual level on the AP, and VisualRF heatmaps may display incorrect information. This issue is caused by changes in the information sent to AirWave by the devices running these versions of ArubaOS.
DE25845	**Symptom**: The configuration snippet push to a ZTP device gets stuck in the "In Progress" state. **Scenario**: After you start a partial configuration job for a group of factory-default devices added to AirWave via ZTP, you might see "In Progress" for the ZTP device in the **Job Details** table on the **Groups > Templates > Partial Config** page. This partial configuration option was designed for only Aruba switches, and factory-default devices should not be available for selection from the partial configuration option.
DE25501	**Symptom**: EAP failures in 802.1X AMON messages are not monitored by AirWave. **Scenario**: If clients with invalid certificates attempt to associate to AirWave, AirWave drops EAP_ FAILURE Dot1x messages, preventing the tracking of clients which are facing EAP-FAILURE.
DE25400	**Symptom:**: The AirWave RAPIDs feature may incorrectly calculate signal strengths from the RSSI value for rogue devices. **Scenario**: The cause of this issue is under investigation.
DE25399	**Symptom**: RAPIDS drops the event that corresponds to the strongest RSSI signal heard from a rogue AP. **Scenario**: RAPIDS records the strongest signal heard for a rogue as the rogue entry's signal value and doesn't overwrite that value until a stronger signal is heard, but RAPIDS may fail to retain the discovery event for that entry.
DE25350	**Symptom**: There is no support for pushing a full configuration for an Aruba switch running the ArubaOS-switch Operating System using the secure file transfer protocols, SCP and SFTP. **Scenario**: If you use the (unsupported) **no tftp** client CLI command, the switch is unable to accept TFTP requests. As a result, AirWave cannot push full configurations to the switch.

Table 21: *Known Issues in AirWave 8.2.1 (Continued)*

ID	Description
DE25268	**Symptom**: Database schema failures do not cause the upgrade process to halt. **Scenario**: When a database schema change fails during a software upgrade, the upgrade process continues running.
DE24019	**Symptom**: When monitoring a stack of Aruba switches, or a standalone switch that has stacking-enabled, AirWave shows a junk record for a switch with a status of Unknown. **Scenario**: This issue occurs when you remove the switch designated as commander from a stack and move it to another part of the network. When SNMP discovery finds the switch in a new stack, the junk record disappears.

Table 22: *Known Issues in AirWave 8.2.0.3*

ID	Description
DE25598 DE25522 DE25500	**Symptom:** After updating the IP address of the controller, you see syslog error messages listed under device events in the **Clients > Detail** page and not in the **Clarity** dashboard. **Scenario:** Underlying issues with ArubaOS caused AirWave to report only DNS information in the **Clarity** dashboard. **Workaround**: In order to view complete Clarity data, upgrade AirWave to 8.2.0.3 or later, and ensure that the controller is running ArubaOS 6.4.3.9, 6.4.4.8, or later.
DE25434	**Symptom:** AirWave sends hundreds of alerts for high CPU or memory usage. **Scenario:** You might encounter this issue if you configured AirWave to send alert notification until it is acknowledged. **Workaround**: When adding a trigger on the **System > Triggers** page, set the Suppress until acknowledge option to Yes.
DE25324	**Symptom:** Upgrading from AirWave 8.0.x caused VisualRF beamwidth, orientation and gain values to reset to their default values. **Scenario:** The beamwidth, orientation and gain values are not retained after flushing the bootstrap file or upgrading the AirWave server. **Workaround**: None.
DE25226	**Symptom**: AirWave takes longer to process station statistics AMON messages than it did in AirWave 8.0.x. **Scenario**: This issue has been associated with the Internet Explorer web browser. **Workaround**: None.

Table 23: *Known Issues in AirWave 8.2.0.2*

ID	Description
DE25398	**Symptom**: When you hover your mouse over the configuration (🔧) icon on the **Groups > List** page, the popup window of available actions might not appear in the correct spot, be hidden out of view, or display at the very bottom of the page. **Scenario**: This issue has been associated with the Internet Explorer web browser. **Workaround**: Use another web browser to access the WebUI, or select a group from the **Groups > List** page and use the navigation bar.

Table 24: *Known Issues in AirWave 8.2*

ID	Description
DE25324	**Symptom**: VisualRF Beamwidth, Orientation and Gain values on deployed APs automatically reset when you upgrade AirWave to any version, or when you remove the bootstrap file. **Scenario**: The beamwidth, orientation and gain values are not retained after flushing the bootstrap file or upgrading the AirWave server.
DE25220	**Symptom**: VisualRF indicated an incorrect number of APs associated with the AirWave server. **Scenario**: In a deployment where over 4,000 APs were associated to an AirWave server, and the active APs status icon at the top of the WebUI page showed the correct number of APs, VisualRF incorrectly indicated that AirWave had over 10,000 associated APs.
DE25154	**Symptom**: If an AP upgrades to Instant 4.2.3 and uses Lync applications in its access control rules, Instant GUI Config (IGC) may show a configuration mismatch for that device. **Scenario**: This issue occurs because the list of Lync applications that can be included in an access control rule in the AirWave 8.2 IGC feature differs from the list of available rules in Instant 4.2.3. The following applications are unsupported by IGC in AirWave 8.2. • SOS ALG SVP • SOS ALG Vocera • SOS ALG FTP • SOS ALG RTSP • SOS ALG SIP • SOS ALG NOE • SOS ALG SIPS • SOS ALG H323 • SOS ALG Facetime • SOS ALG Skype4B Voice • SOS ALG Skype4B Video • SOS ALG Skype4B File-Transfer • SOS ALG Skype4B • SOS ALG SIP-Audio • SOS ALG SIP-Video • SOS ALG Skype4B Desktop-Sharing • SOS ALG Jabber • SOS ALG Jabber-MC • square application • pearsonvue web • squirrelsystems web • learninganalytics web • youtubeeducation web
DE25110	**Symptom**: If a switch IP address is changed from a static IP address to an IP address dynamically assigned via DHCP, the device may appear as down in AirWave. **Scenario**: This issue is triggered because AirWave has no way to determine the IP address that will be assigned to the switch after the change to a DHCP-assigned IP address. **Workaround**: Manually change the IP address when the IP provisioning option is changed from static to DHCP.
DE24785 DE24834 DE24836 DE24872	**Symptom**: When the **Groups > Instant Config** pages of the AirWave WebUI are accessed using the Internet Explorer web browser, these pages may not properly display Instant Config (IGC) configuration settings or browser elements, and may not correctly save or update configuration changes. **Scenario**: This issue occurs when you attempt to use Internet Explorer to create or modify a configuration for Instant devices via **Groups > Instant Config**. This issue does not occur with other supported web browsers. Possible IGC behaviors in Internet Explorer include the following: • Drop-down lists may not display properly • Configured settings may not save or update properly • Scrolling down a page in the IGC WebUI may cause the browser to unexpectedly return to the top of the page. • Clicking the **Save** or **Apply** button may not save any configuration changes, may cause the browser to unexpectedly return to the top of the page. **Workaround**: Use an alternate web browser, such as Mozilla, to configure Instant devices.

Table 24: *Known Issues in AirWave 8.2 (Continued)*

ID	Description
DE24424	**Symptom**: A non-default **Failure Timeout** value configured via **AMP Setup > General > Firmware upgrade/Reboot Options** is not correctly applied. **Scenario**: By default, if a firmware upgrade on a switch fails, that switch state is locked, and the switch cannot attempt another upgrade until the default failure timeout period of 60 minutes has elapsed. In AirWave 8.2, if you configure a non-default value for this failure timeout, the switch state may be locked for a time period equal to the default value of 60 minutes *plus* the new failure timeout period. For example, if you configure a custom failure timeout period of 15 minutes, that setting may keep a switch locked in a pending state for 75 minutes, instead of the expected 15.
DE24417	**Symptom**: Firmware updates on Aruba switches may fail when firmware changes are simultaneously sent to switches in a multi-level switch topology, where an upstream switch is located between a downstream switch and the AirWave server. **Scenario**: This issue occurs when an upstream switch downloads the firmware image and reboots, temporarily disrupting the firmware download on the second, downstream switch. This disruption may cause the firmware upgrade on the second switch to fail. **Workaround**: Perform separate firmware upgrades on switches at different levels. (For example, upgrade the first-level (upstream) switches before you upgrade any second level (downstream) switches.
DE24406	**Symptom**: Backup configurations downloaded from the AirWave WebUI are not compressed properly, cannot be restored. **Scenario**: This issue occurs when a nightly backup file is downloaded using the Chrome web browser. **Workaround**: Use an alternate web browser, such as Mozilla, to download the backup file.
DE24163	**Symptom:** The **Current Secondary Version** column in the **System > Firmware Upgrade Job Detail > Devices Being Upgraded** table displays incorrect image information for an Aruba switch. **Scenario:** The **Devices Being Upgraded** table should display the version number for the software stored in the secondary flash in the **Current Secondary Version** column. This column may instead display the boot ROM software version. **Workaround**: Access the switch command-line interface and issue the command **show flash** to view the primary and secondary image versions.
DE24019	**Symptom:** The **Member Switches** table on the **APs/Devices > Monitor** page for an Aruba switch may display incorrect stack member information. **Scenario:** If a HPE 3810 stack is discovered via SNMP discovery on the network, and the stack member with commander status is moved to another stack, an invalid stack record may appear in the **Member Switch** table for members of the original stack. **Workaround**: Adding another stack to the AirWave server may clear these invalid entries.
DE23592	**Symptom:** VisualRF does not correctly save modifications to floor plans. **Scenario:** When modifying floor plans using the **VisualRF** section of the AirWave WebUI, changes to the floor plans settings (like the floor name or number) are not correctly saved. **Workaround**: Re-measure the floor plan to save modifications to the floor plan settings.

Table 24: *Known Issues in AirWave 8.2 (Continued)*

ID	Description
DE23289	**Symptom:** VisualRF floor plans do not open correctly for clients accessing the AirWave WebUI via the Microsoft Edge browser. **Scenario:** When viewing the **VisualRF** section of the AirWave WebUI using the Microsoft Edge browser on a Windows 10 client, double clicking on a building or floor does not open the page for that building or floor.
DE23281	**Symptom**: If the **APs/Devices > Monitor** page for a device displays a VPN IP address, hovering your mouse over that VPN IP address displays a HTTPS and SSH tooltip that contains invalid links. **Scenario**: This issue occurs because the VPN IP address displayed on that page is an internal IP address. Clicking the HTTP link in the tooltip displays a blank page, and on the SSH link does not log a user into any device.
DE19402	**Symptom**: Reports exported via FTP are not sent if the report is modified, as the modified report fails to authenticate to the FTP server. **Scenario**: This issue occurs when you modify an existing FTP report and do not re-enter the FTP server passwords in the **Export Options** section of the **Reports > Definition > Export Options** page. **Workaround**: Redefine the FTP server password when you modify a report to be exported via FTP.

US14365	**Symptom**: PVOS commands values are unnecessarily grouped in the device running-config
	Scenario: Some ArubaOS-Switch Operation System commands which are executed individually on the switch appear in a group in the device running-config. AirWave supports a 1:1 comparison of commands from the template and the device running-config, so this grouping may incorrectly cause the device to show a mismatch.
	For example, the template may show two separate commands:
	`loop-protect transmit-interval 10`
	`loop-protect disable-timer 3000`
	While the running-config groups these into a single line:
	`loop-protect transmit-interval 10 disable-timer 3000`
	Workaround: Use the grouped command directly in the template to avoid a mismatch.

US14468	**Symptom**: PVOS commands values may vary between the template and device running-config
	Scenario: When using template configuration to configure Power over Ethernet settings, the template command **power-over-ethernet pre-std-detect** is modified in the running configuration to add port values. AirWave supports a 1:1 comparison of commands from the template and the device running-config, so this modification of the value may incorrectly cause the device to show a mismatch.
	For example, the template may show the command:
	`power-over-ethernet pre-std-detect`
	While the running-config adds port number values
	`power-over-ethernet pre-std-detect ports 1-48`

Table 24: *Known Issues in AirWave 8.2 (Continued)*

ID	Description

US14468	**Symptom**: PVOS commands values may vary between the template and device running-config
	Scenario: When using template configuration for 5400R, 3810, and 3800 Aruba switches, if the template command **ip aspath list** does not include a sequence number, the running configuration applies a sequence value of **5**. AirWave supports a 1:1 comparison of commands from the template and the device running-config, so this modification of the value may incorrectly cause the device to show a mismatch.
	For example, the template may show the commands:
	`ip aspath-list listname deny abcd`
	While the running-config adds a sequence number to the running configuration:
	`ip aspath-list "listname" seq 5 deny "abcd"`

US14471	**Symptom**: PVOS commands values may vary between the template and device running-config
	Scenario: On 2530 and 2620 Aruba switches, some ArubaOS-Switch Operation System commands which are executed individually on the switch appear in a modified format in the device running-config, where leading zeros in a configuration value are added or deleted, and hexadecimal values in a template configuration may appear in a decimal value in the running configuration. AirWave supports a 1:1 comparison of commands from the template and the device running-config, so this modification of the value format may incorrectly cause the device to show a mismatch.
	For example, the template may show the command:
	`qos rate-limit dscp 0 1 kbps 0`
	While the running-config adds one or more leading zeros to the value:
	`qos rate-limit dscp 000000 1 kbps 0`
	Workaround: Use the expanded command set in the template to avoid a mismatch.

US14471	**Symptom**: PVOS commands values may vary between the template and device running-config
	Scenario: On 2530 and 2620 Aruba switches, some ArubaOS-Switch Operation System commands which are executed individually on the switch appear in a modified format in the device running-config, where leading zeros in a configuration value are added or deleted, and hexadecimal values in a template configuration may appear in a decimal value in the running configuration. AirWave supports a 1:1 comparison of commands from the template and the device running-config, so this modification of the value format may incorrectly cause the device to show a mismatch.
	For example, the template may show the command:
	`qos rate-limit dscp 0 1 kbps 0`
	While the running-config adds one or more leading zeros to the value:
	`qos rate-limit dscp 000000 1 kbps 0`
	Workaround: Use the expanded command set in the template to avoid a mismatch.

Table 24: *Known Issues in AirWave 8.2 (Continued)*

ID	Description

US14471	**Symptom**: Individual PVOS commands values are unnecessarily divided in the device running-config
	Scenario: Some ArubaOS-Switch Operation System commands which are executed individually on the switch appear in multiple lines in the device running-config. AirWave supports a 1:1 comparison of commands from the template and the device running-config, so this grouping may incorrectly cause the device to show a configuration mismatch.
	For example, the template may show one individual command:
	`ip source-interface all vlan 1`
	While the running-config divides the values from this command into multiple lines:
	`ip source-interface tacacs vlan 1`
	`ip source-interface radius vlan 1`
	`ip source-interface syslog vlan 1`
	`ip source-interface telnet vlan 1`
	`ip source-interface tftp vlan 1`
	`ip source-interface sntp vlan 1`
	`ip source-interface sflow vlan 1`
	Workaround: Use the expanded command set in the template to avoid a mismatch.

138330	**Symptom**: AirWave may not correctly display port statistics or interface information for managed nodes or Services Controllers running ArubaOS 8.0 beta **Scenario**: This issue occurs when AirWave attempts to display information for managed nodes or a Services Controller running ArubaOS 8.0 beta in a topology where the Services Controller is installed on a server VM.
137999	**Symptom**: AirWaveis unable to create a backup of the current configuration or flash memory on a Service Controller running ArubaOS 8.0 beta. **Scenario**: A user cannot use AirWave to issue the **backup flash** and **copy flash** commands create a Services Controller backup or copy the backup file to another location. **Workaround**: Create a backup file for a Services Controller directly on that device.
137778	**Symptom**: AirWave may not correctly display the serial number for managed nodes or Services Controllers running ArubaOS 8.0 beta. **Scenario**: This issue occurs because AirWave 8.2 reads the serial number information from the legacy MIB OID **wlsxSwitchLicenseSerialNumber**, which does not return the correct serial number value. **Workaround**: Access the command-line interface of the device and issue the command **show inventory** to view the correct device serial number.
N/A	**Symptom**: Due to a known issue on an Aruba switch (CR191863), the switch state does not change from **Factory** to **Non-Factory** unless the switch reboots. If AirWave pushes a partial configuration that does not require a reboot, AirWave continues to see the switch in the **Factory** state. **Scenario**: The switch UI page that allows you to fetch a template includes a **Push complete configuration file: Device is rebooted after config push** option. If a user selects **No** for this option on a factory-default switch provisioned via a DHCP server, AirWave only pushes a delta configuration, which does not result in a switch reboot. If a user adds settings via AirWave that are not supported by AirWave 8.2, the full configuration is not pushed and hence the unsupported commands are not applied on the switch.

Table 24: *Known Issues in AirWave 8.2 (Continued)*

ID	Description
N/A	**Symptom**: If a user decides to reset the switch to a factory default state from the switch command-line interface, all stored passwords, security credentials and system settings will reboot in a factory default state. **Scenario**: This issue occurs because AirWave always executes the **include-credentials** command when pushing a configuration to a switch.
N/A	**Symptom**: Unrecognized PVOS command syntax. **Scenario:** AirWave may not recognize some syntax for some ArubaOS-Switch Operating System commands, and therefore will not allow to users to configure these commands via AirWave.

N/A	**Symptom**: Unrecognized PVOS defaults and values.
	Scenario: AirWave may not recognize some default values or the "no" syntax for some ArubaOS-SwitchOperating System commands, and therefore will not recognize these values when these commands are configured via AirWave.
	For example, if a template has the command **ipv6 hop-limit 100**, AirWave would be expected to push the default value for this command (64 hops) if that line is removed from the template. If the default value is missing from the command and not recognized by AirWave, the device could not return to its default value, and a configuration mismatch could occur.
	Workaround: Issue the default value for the command within **<push_to_exclude>** tags in the template, as shown below.
	`<push_to_exclude>`
	`   ipv6 hop-limit 64`
	`</push_to_exclude>`

N/A	**Symptom**: Commands are hidden in the running-config.
	Scenario: Some commands may be hidden by the switch in the running-config and CLI help. Additional steps may be required to add these command settings via template configuration.
	Workaround: Add a hidden command to a device running config by including within **<push_to_exclude>** tags. For example, to ad the commands **crypto key zeroize autorun rsa** and **crypto key zeroize ssh-client-key**, to the template, use the following format:
	`<push_to_exclude>`
	`crypto key zeroize autorun rsa`
	`crypto key zeroize ssh-client-key`
	`</push_to_exclude>`