Configuring Adaptive Radio Management (ARM) Profiles and Settings

This document describes how to configure the ARM function to automatically select the best channel and transmission power settings for each AP on your WLAN. After completing the tasks described in the following pages, you can continue configuring your APs as described in the Aruba User Guide.

This document includes the following topics:

ARM Overview

Aruba's proprietary Adaptive Radio Management (ARM) technology maximizes WLAN performance even in the highest traffic networks by dynamically and intelligently choosing the best 802.11 channel and transmit power for each Aruba AP in its current RF environment.

Aruba's ARM technology solves wireless networking challenges such as large deployments, dense deployments, and installations that must support VoIP or mobile users. Deployments with dozens of users per access point can cause network contention and interference, but ARM dynamically monitors and adjusts the network to ensure that all users are allowed ready access. ARM provides the best voice call quality with voice-aware spectrum scanning and call admission control.

With earlier technologies, network administrators would have to perform a site survey at each location to discover areas of RF coverage and interference, and then manually configure each AP according to the results of this survey. Static site surveys can help you choose channel and power assignments for APs, but these surveys are often time-consuming and expensive, and only reflect the state of the network at a single point in time. ARM is more efficient than static calibration, and, unlike older technologies, it continually monitors and adjusts radio resources to provide optimal network performance. Automatic power control can adjust AP power settings if adjacent APs are added, removed, or moved to a new location within the network, minimizing interference with other WLAN networks. ARM adjusts only the affected APs, so the entire network does not require systemic changes.

ARM Support for 802.11n

ArubaOS version 3.3.x or later supports APs with the 802.11n standard, ensuring seamless integration of 802.11n devices into your RF domain. An Aruba AP's 5 Ghz band capacity simplifies the integration of new APs into your legacy network. You can also replace older APs with newer 802.11n-compliant APs while reusing your existing cabling and PoE infrastructure.

A high-throughput (HT) AP can use a 40 MHz channel pair comprised of two adjacent 20 MHz channels available in the regulatory domain profile for your country. When ARM is configured for a dual-band AP, it will dynamically select the primary and secondary channels for these devices. It can, however, continue to scan all changes in the a+b/g bands to calculate interference and detect rogue APs.

Monitoring Your Network with ARM

When ARM is enabled, an Aruba AP will dynamically scan all 802.11 channels within its 802.11 regulatory domain at regular intervals and will report everything it sees to the controller on each channel it scans. This includes, but is not limited to, data regarding WLAN coverage, interference, and intrusion detection. You can retrieve this information from the controller to get a quick health check of your WLAN deployment without having to walk around every part of a building with a network analyzer. (For additional information on the individual metrics gathered on the AP's current assigned RF channel, see "ARM Metrics" on page 11.)

An AP configured with ARM is aware of both 802.11 and non-802.11 noise, and will adjust to a better channel if it reaches a configured threshold for either noise, MAC errors or PHY errors. The ARM algorithm is based on what the individual AP hears, so each AP on your WLAN can effectively "self heal" by compensating for changing scenarios like a broken antenna or blocked signals from neighboring APs. Additionally, ARM periodically collects information about neighboring APs to help each AP better adapt to its own changing environment.

Application Awareness

Aruba APs keep a count of the number of data bytes transmitted and received by their radios to calculate the traffic load. When a WLAN gets very busy and traffic exceeds a predefined threshold, load-aware ARM dynamically adjusts scanning behavior to maintain uninterrupted data transfer on heavily loaded systems. ARM-enabled APs will resume their complete monitoring scans when the traffic has dropped to normal levels. You can also define a firewall policy that pauses ARM scanning when the AP detects critically important or latency-sensitive traffic from a specified host or network.

ARM's band steering feature encourages dual-band capable clients to stay on the 5GHz band on dual-band APs. This frees up resources on the 2.4GHz band for single band clients like VoIP phones.

The ARM "Mode Aware" option is a useful feature for single radio, dual-band WLAN networks with high density AP deployments. If there is too much AP coverage, those APs can cause interference and negatively impact your network. Mode aware ARM can turn APs into Air Monitors if necessary, then turn those Air Monitors back into APs when they detect gaps in coverage.

Managing ARM Profiles

You configure ARM by defining ARM *profiles*, a set of configuration parameters that you can apply as needed to an AP group or to individual APs. Aruba controllers have one preconfigured ARM profile, called **default**. Most network administrators will find that this one default ARM profile is sufficient to manage all the Aruba APs on their WLAN. Others may want to define multiple profiles to suit their APs' varying needs.

When managing ARM profiles, you should first consider whether or not all the APs on your WLAN operate in similar environments and manage similar traffic loads and client types.

If your APs' environment and traffic loads are mostly the same, you can use the default ARM profile to manage all the APs on your WLAN. If you ever modify the default profile, all APs on the WLAN will be updated with the new settings. If, however, you have APs on your WLAN that are in different physical environments, or your APs each manage widely varying client loads or traffic types, you should

consider defining additional ARM profiles for your AP groups. The following table describes different WLAN environments, and the type of ARM profiles appropriate for each.

Table 1 *ARM Profile Types*

ARM Profiles	Example WLAN Description
default profile only	• A warehouse where the physical environment is nearly the same for all APs, and each AP manages the same number of clients and traffic load. • A training room, where the clients are evenly spaced throughout the room, have the same security requirements and are using the same amount of network resources.
multiple profiles	• Universities where APs are in different building types (open auditoriums, small brick classrooms), some APs must support VoIP or video streaming, and mobile clients are constantly moving from one AP coverage area to another. • Healthcare environments where some APs must balance the network demands of large digital radiology files, secure electronic patient record transfers, diagnostic videos, and collaborative VoIP sessions, while other APs (like those in a lobby or cafeteria) support only lower-priority traffic like Internet browsing.

You assign ARM profiles to AP groups by associating an ARM profile with that AP group's 802.11a or 802.11g RF management profile. For details on associating an ARM profile with an AP group, see "Assigning a New ARM Profile to an AP Group" on page 7.

Using the WebUI to Create a New ARM Profile

There are two ways to create a new ARM profile via the WebUI. You can make an entirely new profile with all default settings, or you can create a new profile based upon the settings of an existing profile.

To create a new ARM profile with all default settings:

1. Select **Configuration** > **All Profiles**. The **All Profile Management** window opens.
2. Select **RF Management** to expand the **RF Management** section.
3. Select **Adaptive Radio Management (ARM) Profile**. Any currently defined ARM profiles appears in the right pane of the window. If you have not yet created any ARM profiles, this pane displays the **default** profile only.
4. To create a new profile with all default settings, enter a name in the entry blank. The name must be 1-63 characters, and can be composed of alphanumeric characters, special characters and spaces. If your profile name includes a space, it must be enclosed within quotation marks.
5. Click **Add**.

To create a new ARM profile based upon the settings of another existing profile:

1. Follow steps 1-3 in the above procedure to access the **Adaptive Radio Management (ARM) profile** window.
2. From the list of profiles, select the profile with the settings you would like to copy.
3. Click **Save As**.
4. Enter a name for the new profile in the entry blank. The name must be 1-63 characters, and can be composed of alphanumeric characters, special characters and spaces.
5. Click **Apply**.

Using the CLI to Create a New ARM Profile

Use the following CLI command to create a new ARM profile.

```
rf arm-profile <profile>
```

where <profile> is a unique name for the new ARM profile. The name must be 1-63 characters, and can be composed of alphanumeric characters, special characters and spaces. If your profile name includes a space, it must be enclosed within quotation marks.

Configuring ARM Settings Using the WebUI

In most network environments, ARM does not need any adjustments from its factory-configured settings. However, if you are using VoIP or have unusually high security requirements you may want to manually adjust the ARM thresholds.

To change an ARM profile:

1. Select **Configuration** > **All Profiles**. The **All Profile Management** window opens.
2. Select **RF Management** to expand the **RF Management** section.
3. Select **Adaptive Radio Management (ARM) Profile**.
4. Select the name of the profile you want to edit. The **Adaptive Radio Management (ARM) profile** window opens.
5. Change any of the ARM settings described in the table below, then click **Apply** to save your changes.

Table 2 *ARM Profile Configuration Parameters*

Setting	Description
Assignment	Activates one of four ARM channel/power assignment modes. • disable: Disables ARM calibration and reverts APs back to default channel and power settings specified by the AP's radio profile • maintain: APs maintain their current channel and power settings. This setting can be used to maintain AP channel and power levels after ARM has initially selected the best settings. • multi-band: For single-radio APs, this value computes ARM assignments for both 5 GHZ (802.11a) and 2.4 GHZ (802.11b/g) frequency bands. • single-band: For dual-radio APs, this value enables APs to change transmit power and channels within their same frequency band, and to adapt to changing channel conditions. Default: single-band
Client Aware	If the **Client Aware** option is enabled, the AP does not change channels if there is active client traffic on that AP. If **Client Aware** is disabled, the AP may change to a more optimal channel, but this change may also disrupt current client traffic. Default: enabled
Min Tx Power	Sets the lowest transmit power levels for the AP, from 0-30 dBm, in 3 dBm increments. Note that power settings will not change if the **Assignment** option is set to **disabled** or **maintain**. Default: 9 dBm **NOTE:** Consider configuring a **Min Tx Power** setting higher than the default value if most of your APs are placed on the ceiling. APs on a ceiling often have good line of sight between them, which will cause ARM to decrease their power to prevent interference. However, if the wireless clients down on the floor do not have such a clear line back to the AP, you could end up with coverage gaps.
Max Tx Power	Sets the highest transmit power levels for the AP, from 0-30 dBm in 3 dBm increments. Higher power level settings may be constrained by local regulatory requirements and AP capabilities. In the event that an AP is configured for a **Max Tx Power** setting it cannot support, this value will be reduced to the highest supported power setting. Default: 30 dBm **NOTE:** Power settings will not change if the **Assignment** option is set to **disabled** or **maintain**.

Table 2 *ARM Profile Configuration Parameters*

Setting	Description
Multi Band Scan	If enabled, single radio channel APs scans for rogue APs across multiple channels. This option requires that **Scanning** is also enabled. (The **Multi Band Scan** option does not apply to APs that have two radios, such as an Aruba AP-65 or AP-70, as these devices already scan across multiple channels. If one of these dual-radio devices are assigned an ARM profile with Multi Band enabled, that device will ignore this setting.) Default: disabled
Rogue AP Aware	If you have enabled both the **Scanning** and **Rogue AP options**, Aruba APs may change channels to contain off-channel rogue APs with active clients. This security features allows APs to change channels even if the **Client Aware** setting is disabled. This setting is disabled by default, and should only be enabled in high-security environments where security requirements are allowed to consume higher levels of network resources. You may prefer to receive Rogue AP alerts via SNMP traps or syslog events. Default: disabled
Scan Interval	If **Scanning** is enabled, the **Scan Interval** defines how often the AP will leave its current channel to scan other channels in the band. Off-channel scanning can impact client performance. Typically, the shorter the scan interval, the higher the impact on performance. If you are deploying a large number of new APs on the network, you may want to lower the Scan Interval to help those APs find their optimal settings more quickly. Raise the Scan Interval back to its default setting after the APs are functioning as desired. The supported range for this setting is 0-2,147,483,647 seconds. Default: 10 seconds
Active Scan	When the **Active Scan** checkbox is selected, an AP initiates active scanning via probe request. This option elicits more information from nearby APs, but also creates additional management traffic on the network. **Active Scan** is disabled by default, and should *not be enabled* except under the direct supervision of Aruba Support. Default: disabled
Scanning	The **Scanning** checkbox enables or disables AP scanning across multiple channels. Disabling this option also disables the following scanning features: • Multi Band Scan • Rogue AP Aware • Voip Aware Scan • Power Save Scan Do not disable Scanning unless you want to disable ARM and manually configure AP channel and transmission power. Default: enabled
Scan Time	The amount of time, in milliseconds, an AP will drift out of the current channel to scan another channel. The supported range for this setting is 0-2,147,483,647 seconds. Aruba recommends a scan time between 50-200 msec. Default: 110 msec
VoIP Aware Scan	Aruba's VoIP Call Admission Control (CAC) prevents any single AP from becoming congested with voice calls. When you enable CAC, you should also enable **VoIP Aware Scan** in the ARM profile, so the AP will not attempt to scan a different channel if one of its clients has an active VoIP call. This option requires that **Scanning** is also enabled. Default: enabled
Power Save Aware Scan	If enabled, the AP will not scan a different channel if it has one or more clients and is in power save mode. Default: disabled

Table 2 *ARM Profile Configuration Parameters*

Setting	Description
Ideal Coverage Index	The Aruba coverage index metric is a weighted calculation based on the RF coverage for all ArubaAPs and neighboring APs on a specified channel. The **Ideal Coverage Index** specifies the ideal coverage that an AP should try to achieve on its channel. The denser the AP deployment, the lower this value should be. The range of possible values is 2-20. Default: 10 For additional information on how this the Coverage Index is calculated, see "ARM Metrics" on page 11.
Acceptable Coverage Index	For multi-band implementations, the **Acceptable Coverage Index** specifies the minimal coverage an AP it should achieve on its channel. The denser the AP deployment, the lower this value should be. The range of possible values is 1-6. Default: 4
Free Channel Index	The Aruba Interference index metric measures interference for a specified channel and its surrounding channels. This value is calculated and weighted for all APs on those channels (including 3rd-party APs). An AP will only move to a new channel if the new channel has a lower interference index value than the current channel. **Free Channel Index** specifies the required difference between the two interference index values before the AP moves to the new channel. The lower this value, the more likely it is that the AP will move to the new channel. The range of possible values is 10-40. Default: 25 For additional information on how this the Channel Index is calculated, see "ARM Metrics" on page 11.
Backoff TIme	After an AP changes channel or power settings, it waits for the backoff time interval before it asks for a new channel/power setting. The range of possible values is 120-3600 seconds. Default: 240 seconds
Error Rate Threshold	The minimum percentage of PHY errors and MAC errors in the channel that will trigger a channel change. Default: 50%
Error Rate Wait Time	Minimum time in seconds the error rate has to exceed the Error Rate Threshold before it triggers a channel change. Default: 30 seconds
Noise Threshold	Maximum level of noise in channel that triggers a channel change. The range of possible 0-2,147,483,647 dBm. Default 75 dBm
Noise Wait Time	Minimum time in seconds the noise level has to exceed the Noise Threshold before it triggers a channel change. The range of possible values is 120-3600 seconds. Default: 120 seconds
Minimum Scan Time	Minimum number of times a channel must be scanned before it is considered for assignment. The supported range for this setting is 0-2,147,483,647 scans. Aruba recommends a **Minimum Scan Time** between 1-20 scans. Default: 8 scans
Load Aware Scan Threshold	Load aware ARM preserves network resources during periods of high traffic by temporarily halting ARM scanning if the load for the AP gets too high. The **Load Aware Scan Threshold** is the traffic throughput level an AP must reach before it stops scanning. The supported range for this setting is 0-20000000 bytes/second. (Specify 0 to disable this feature.) Default: 1250000 Bps
Mode Aware ARM	If enabled, ARM will turn APs into Air Monitors (AMs) if it detects higher coverage levels than necessary. This helps avoid higher levels of interference on the WLAN. Although this setting is disabled by default, you may want to enable this feature if your APs are deployed in close proximity (e.g. less than 60 feet apart). Default: disabled

Configuring ARM Using the CLI

You must be in config mode to create, modify or delete an ARM profile using the CLI. Specify an existing ARM profile with the <profile-name> parameter to modify an existing ARM profile, or enter a new name to create an entirely new profile.

Configuration details and any default values for each of these parameters are described in Table 2 on page 4. If you do not specify a parameter for a new profile, that profile uses the default value for that parameter. Put the **no** option before any parameter to remove the current value for that parameter and return it to its default setting. Enter **`exit`** to leave the ARM profile mode.

Use the following command to create or modify an ARM profile:

```
rf arm-profile <profile>
   40MHz-allowed-bands {All|None|a-only|g-only}
   acceptable-coverage-index <number>
   active-scan (not intended for use)
   assignment {disable|maintain|multi-band|single-band}
   backoff-time <seconds>
   client-aware
   clone <profile>
   error-rate-threshold <percent>
   error-rate-wait-time <seconds>
   free-channel-index <number>
   ideal-coverage-index <number>
   load-aware-scan-threshold <Mbps>
   max-tx-power <dBm>
   min-scan-time <# of scans>
   min-tx-power <dBm>
   mode-aware (not intended for use)
   multi-band-scan
   no
   noise-threshold <number>
   noise-wait-time <seconds>
   ps-aware-scan
   rogue-ap-aware
   scan-interval <seconds>
   scan-time <milliseconds>
   scanning
   voip-aware-scan
```

Assigning a New ARM Profile to an AP Group

Once you have created a new ARM profile, you must assign it to a group of APs before those ARM settings go into effect. Each AP group has a separate set of configuration settings for its 802.11a radio profile and its 802.11g radio profile. You can assign the same ARM profile to each radio profile, or select different ARM profiles for each radio.

Assigning ARM Profiles Using the WebUI

To assign an ARM profile to an AP group via the Web User Interface:

1. Select **Configuration** > **AP Configuration**.
2. If it is not already selected, click the **AP Group** tab.
3. Click the **Edit** button beside the AP group to which you want to assign the new ARM profile.
4. Expand the **RF Management** section in the left window pane.
5. Select a radio profile for the new ARM profile.

- To assign a new profile to an AP group's 802.11a radio profile, expand **the 802.11a radio profile** section.
- To assign a new profile to an AP group's 802.11g radio profile, expand the **802.11g radio profile** section.

6. Select **Adaptive Radio management (ARM) Profile**.
7. Click the **Adaptive Radio Management (ARM) Profile** drop-down list in the right window pane, and select a new ARM profile.
8. (Optional) repeat steps 6-8 to select an ARM profile for another profile.
9. Click **Apply** to save your changes.

You can also assign an ARM profile to an AP group by selecting a radio profile, identifying an AP group assigned to that radio profile, and then assigning an ARM profile to one of those groups.

1. Select **Configuration > All Profiles**.
2. Select **RF Management** and then expand either the **802.11a radio profile** or **802.11b radio profile**.
3. Select an individual radio profile name to expand that profile.
4. Click **Adaptive Radio Management (ARM) Profile**, and then use the **Adaptive Radio management (ARM) Profile** drop-down list in the right window pane to select a new ARM profile for that radio.

Assigning ARM Profiles Using the CLI

To assign an ARM profile to an AP group via the CLI, issue the following commands:

```
rf dot11a-radio-profile <ap_profile>
   arm-profile <arm_profile>
```

and

```
rf dot11g-radio-profile <ap_profile>
   arm-profile <arm_profile>
```

Where <ap_profile> is the name of the AP group, and <arm_profile> is the name of the ARM profile you want to assign to that radio band.

Deleting an ARM profile

You can only delete unused ARM profiles; Aruba will not let you delete an ARM profile that is currently assigned to an AP group.

To delete an ARM profile using the WebUI:

1. Select **Configuration** > **All Profiles**. The **All Profile Management** window opens.
2. Select **RF Management** to expand the **RF Management** section.
3. Select **Adaptive Radio Management (ARM) Profile**.
4. Select the name of the profile you want to delete.
5. Click **Delete**.

To delete an ARM profile using the CLI, issue the command

```
no rf arm-profile <profile>
```

where <profile> is the name of the ARM profile you wish to remove.

Band Steering

ARM's band steering feature encourages dual-band capable clients to stay on the 5GHz band on dual-band APs. This frees up resources on the 2.4GHz band for single band clients like VoIP phones.

Band steering reduces co-channel interference and increases available bandwidth for dual-band clients, because there are more channels on the 5GHz band than on the 2.4GHz band. Dual-band 802.11n-capable clients may see even greater bandwidth improvements, because the band steering feature will automatically select between 40MHz or 20MHz channels in 802.11n networks. This feature is disabled by default, and must be enabled in a Virtual AP profile.

The Band Steering feature will not work unless the you use the disable the "Local Probe Response" parameter in the Wireless LAN SSID profile for the SSID that requires this feature. You can disable the local probe response parameter using the CLI command **wlan ssid-profile <profile> no local-probe-response**.

Enable or Disable Band Steering using the WebUI

Band steering is configured in a virtual AP profile.

1. Select **Configuration** > **All Profiles**. The **All Profile Management** window opens.
2. Select **Wireless LAN** to expand the **Wireless LAN** section.
3. Select **Virtual AP profile** to expand the **Virtual AP Profile** section.
4. Select the name of the Virtual AP profile for which you want to enable band steering.

   (To create a new virtual AP profile, enter a name for a new profile in the **Profile Details** window, then click **Add** button. The new profile will appear in the **Profiles** list. Select that profile to open the **Profile Details** pane.)
5. In the **Profile Details** pane, select **Band Steering**. to enable this feature, or uncheck the **Band Steering** checkbox to disable this feature.
6. Click **Apply** to save your changes.

Configure Band Steering using the CLI

You must be in config mode to configure band steering in a Virtual AP profile. Use the following command to enable band steering. Specify an existing virtual AP with the <name> parameter to modify an existing profile, or enter a new name to create an entirely new virtual AP profile.

```
wlan virtual-ap <profile> band-steering
```

To disable band steering, include the **no** parameter

```
wlan virtual-ap <profile> no band-steering
```

Assign a Virtual AP Profile to an AP or AP Group

You can configure and apply multiple instances of virtual AP profiles to an AP group or to an individual AP. Use the following commands to apply a virtual AP profile to an AP group or an individual AP.

```
ap-group <name> virtual-ap <profile>

ap-name <name> virtual-ap <profile>
```

Traffic Shaping

In a mixed-client network, it is possible for slower clients to bring down the performance of the whole network. To solve this problem and ensure fair access to all clients independent of their WLAN or IP stack capabilities, an AP can implement the traffic shaping feature. This feature has the following three options:

- **default-access:** Traffic shaping is disabled, and client performance is dependent on MAC contention resolution. This is the default traffic shaping setting.
- **fair-access:** Each client gets the same airtime, regardless of client capability and capacity. This option is useful in environments like a training facility or exam hall, where a mix of 802.11a/g, 802.11g and 802.11n clients need equal to network resources, regardless of their capabilities.
- **preferred-access:** High-throughput (802.11n) clients do not get penalized because of slower 802.11a/g or 802.11b transmissions that take more air time due to lower rates. Similarly, faster 802.11a/g clients get more access than 802.11b clients

With this feature, an AP keeps track of all BSSIDs active on a radio, all clients connected to the BSSID, and 802.11a/g, 802.11b, or 802.11n capabilities of each client. Every sampling period, airtime is allocated to each client, giving it opportunity to get and receive traffic. The specific amount of airtime given to an individual client is determined by;

- Client capabilities (802.11a/g, 802.11b or 802.11n)
- Amount of time the client spent receiving data during the last sampling period
- Number of active clients in the last sampling period
- Activity of the current client in the last sampling period

The **bw-alloc** parameter of a traffic management profile allows you to set a minimum bandwidth to be allocated to a virtual AP profile when there is congestion on the wireless network.You must set traffic shaping to **fair-access** to use this bandwidth allocation value for an individual virtual AP.

Configure Traffic Shaping using the WebUI

Traffic shaping is configured in an 802.11a or 802.11b traffic management profile

1. Select **Configuration** > **All Profiles**. The **All Profile Management** window opens.
2. Select **QoS** to expand the **QoS** section.
3. Select **802.11a Traffic management profile** or 802.11g **Traffic management profile** section.
4. In the **Profiles** list, select the name of the traffic management profile for which you want to configure traffic shaping.

   (If you do not have any traffic management profiles configured, click the Traffic Management profile drop-down list and select **NEW**. Enter a name for a new profile in the **Profile Details** pane.)
5. In the **Profile Details** pane, click the **Station Shaping Policy** drop-down list and select either **default-access**, **fair-access** or **preferred-access**.
6. Click **Apply** to save your changes.

Configure Traffic Shaping using the CLI

You must be in config mode to configure traffic shaping in a traffic management profile. Use the following command to enable traffic shaping:

```
wlan traffic-management-profile <profile> fair-access|preferred-access
```

To disable band steering, use the **default-profile** parameter

```
wlan traffic-management-profile <profile> default-access
```

Assign a Traffic Management Profile to an AP or AP Group

Use the following commands to apply an 802.11a or 802.11g traffic management profile to an AP group or an individual AP.

```
ap-group <name> dot11a-traffic-mgmt-profile|dot11g-traffic-mgmt-profile <profile>
ap-name <name> dot11a-traffic-mgmt-profile|dot11g-traffic-mgmt-profile <profile>
```

ARM Metrics

ARM computes coverage and interference metrics for each valid channel and chooses the best performing channel and transmit power settings for each AP's RF environment. Each AP gathers other metrics on their ARM-assigned channel to provide a snapshot of the current RF health state.

The following two metrics help the AP decide which channel and transmit power setting is best.

- **Coverage Index**: The AP uses this metric to measure RF coverage. The coverage index is calculated as x/y, where "x" is the AP's weighted calculation of the Signal-to-Noise Ratio (SNR) on all valid APs on a specified 802.11 channel, and "y" is the weighted calculation of the ArubaAPs SNR the neighboring APs see on that channel.

  To view these values for an AP in your current WLAN environment issue the CLI command **`show ap arm rf-summary ap-name <ap-name>`**, where ***`<ap-name>`*** is the name of an AP for which you want to view information.
- **Interference Index**: The AP uses this metric to measure co-channel and adjacent channel interference. The Interference Index is calculated as a/b//c/d, where:
  - Metric value "a" is the channel interference the AP sees on its selected channel.
  - Metric value "b" is the interference the AP sees on the adjacent channel.
  - Metric value "c" is the channel interference the AP's neighbors see on the selected channel.
  - Metric value "d" is the interference the AP's neighbors see on the adjacent channel

  To manually calculate the total Interference Index for a channel, issue the CLI command **`show ap arm rf-summary ap-name <ap-name>`**, then add the values $a+b+c+d$.

Each AP also gathers the following additional metrics, which can provide a snapshot of the current RF health state. View these values for each AP using the CLI command **`show ap arm rf-summary <AP-IP-address>`**.

- Amount of Retry frames (measured in %)
- Amount of Low-speed frames (measured in %)
- Amount of Non-unicast frames (measured in %)
- Amount of Fragmented frames (measured in %)
- Amount of Bandwidth seen on the channel (measured in kbps)
- Amount of PHY errors seen on the channel (measured in %)
- Amount of MAC errors seen on the channel (measured in %)
- Noise floor value for the specified AP

ARM Troubleshooting

If the APs on your WLAN do not seem to be operating at an optimal channel or power setting, you should first verify that both the ARM feature and ARM scanning have been enabled. Optimal ARM performance requires that the APs have IP connectivity to their Master Controller, as it is the master controler that gives each AP the global classification information required to keep accurate coverage

index values. If ARM is enabled but does not seem to be working properly, try some of the following troubleshooting tips.

Too many APs are on the Same Channel

If many APs are selecting the same RF channel, there may be excessive interference on the other valid 802.11 channels. Issue the CLI command **`show ap arm rf-summary <ap ip address>`** and calculate the Interference index (*intf_idx*) for all the valid channels.

An AP will only move to a new channel if the new channel has a lower interference index value than the current channel. The ARM Free Channel Index parameter specifies the required difference between two interference index values. If this value is set too high, the AP will not switch channels, even if the interference is slightly lower on another channel. Lower the Free Channel Index to improve the likelihood that the AP will switch to a better channel.

Wireless Clients Report a Low Signal Level From All APs

If APs detect strong signals from other APs on the same channel, they may decrease their power levels accordingly. Issue the CLI command **`show ap arm rf-summary <ap ip address>`** for all APs and check their current coverage index (*cov-idx*). If the AP's coverage index is at or higher than the configured coverage index value, then the APs have correctly chosen the transmit power setting. To manually increase the minimum power level for the APs, define a higher minimum value with the command **`ap location <ap location id> arm min-tx-power <value from 0 – 4>.`**

If wireless clients still report that they see low signal levels for the APs, check that the AP's antennas are correctly connected to the AP and correctly placed according to the manufacturer's installation guide.

Transmission Power Levels Change Too Often

Frequent changes in transmission power levels can indicate an unstable RF environment, but can also reflect incorrect ARM or AP settings. To slow down the frequency at which the APs change their transmit power, set the ARM Backoff Time to a higher value. If APs are using external antennas, check the **Configuration > Wireless > AP Installation > Provisioning** window to make sure the APs are statically configured for the correct dBi gain, antenna type, and antenna number. If only one external antenna is connected to its radio, you must select either antenna number 1 or 2.

APs Detect Errors but Do Not Change Channels

First, ensure that ARM error checking is not disabled. The ARM Error Rate Threshold should be set to a percentage higher than zero. The suggested configuration value for the ARM Error Rate Threshold is 30-50%.

APs are not Changing Channels When There is a Lot of Channel Noise

APs will only change channels due to interference if ARM noise checking is enabled. Check to verify that the ARM Noise Threshold is set to a value higher than 0 dBm. The suggested setting for this threshold is 75 dBm.

Contacting Aruba Networks

Web Site Support	
Main Site	http://www.arubanetworks.com
Support Site	https://support.arubanetworks.com
Software Licensing Site	https://licensing.arubanetworks.com/login.php
Wireless Security Incident Response Team (WSIRT)	http://www.arubanetworks.com/support/wsirt.php
Support Emails	
• Americas and APAC	support@arubanetworks.com
• EMEA	emea.support@arubanetworks.com
WSIRT Email Please email details of any security problem found in an Aruba product.	wsirt@arubanetworks.com

Telephone Support	
Aruba Corporate	+1 (408) 227-4500
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Support	
• United States	800-WI-FI-LAN (800-943-4526)
• Universal Free Phone Service Number (UIFN): Australia, Canada, China, France, Germany, Hong Kong, Ireland, Israel, Japan, Korea, Singapore, South Africa, Taiwan, and the UK.	+800-4WIFI-LAN (+800-49434-526)
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