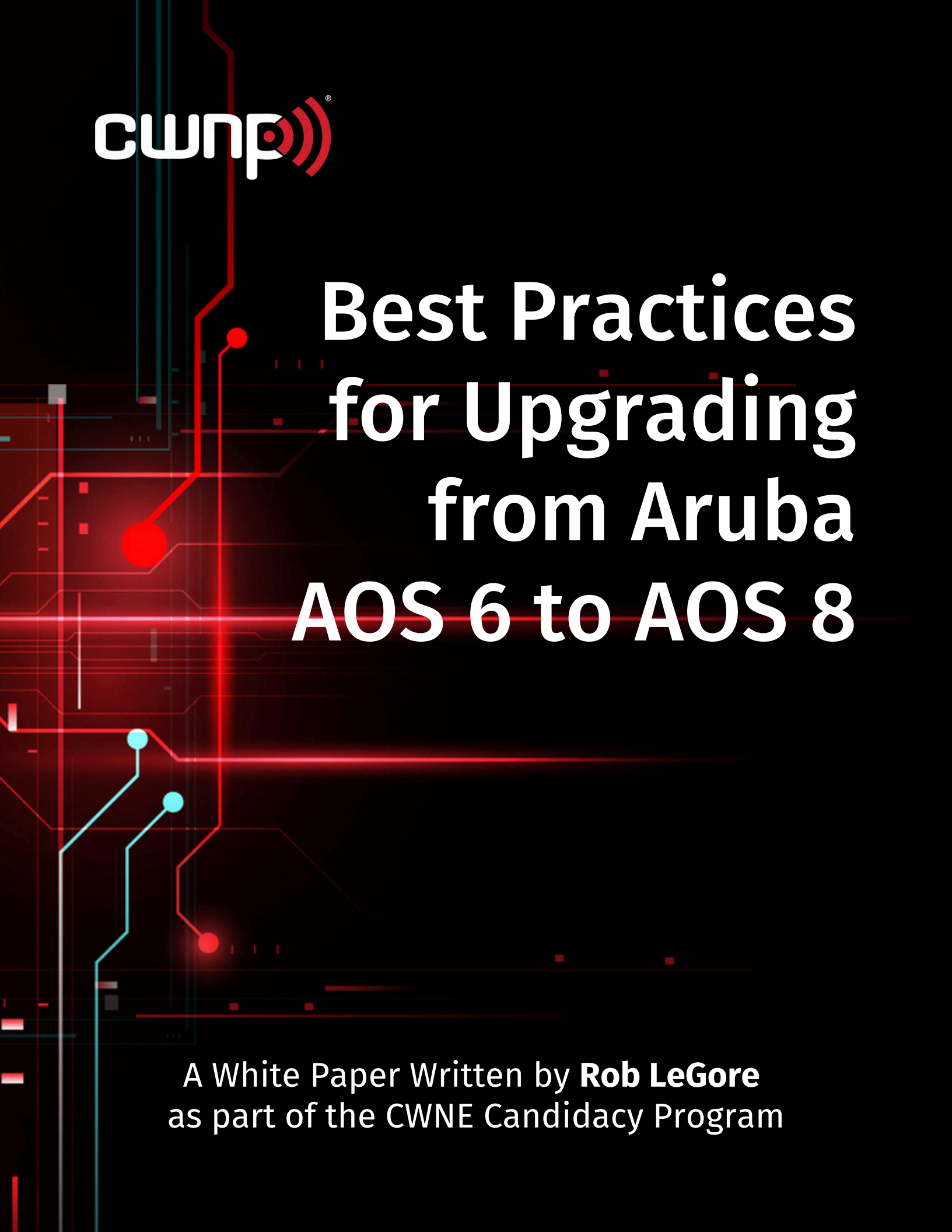

# Best Practices for Upgrading from Aruba AOS 6 to AOS 8

A White Paper Written by **Rob LeGore**
as part of the CWNE Candidacy Program

# Table of Contents

While Wi-Fi has been present in the enterprise environment for over 25 years, recent advances in throughput have made it an honest contender compared to wired ethernet links in either small or large deployments. Wi-Fi has long been able to provide mobility for users in these environments, but it is now realistic to provide gigabit speeds to these users as well. This has created even larger demands on IT professionals as Wi-Fi has become more mission critical in all deployments. These demands include scalability, security, and redundancy. Aruba AOS 8 represented a large jump forward in those categories as compared to the previous iteration of the AOS, which was AOS 6.In addition to an all new much easier to navigate graphical user interface, AOS 8 provides[1] much improved redundancy, security, and scalability for all those who choose to implement it. This whitepaper is intended to provide a guide for administrators to be able to upgrade from AOS 6 to AOS 8, specifically without using the Aruba Migration tool as a guide for upgrading. Via a description of many of the challenges and solutions to those challenges inherent to the upgrade process, this paper intends to make the process much less murky for those who need to undertake it.

## ARUBA MIGRATION TOOL

In order to help with the migration process, Aruba created the Migration Tool to allow for ease of transition with a migration. However, all the Aruba SE's I have spoken with do not recommend the use of the tool. In their opinion it is better to just build your configuration from scratch before migrating and then manually migrate once ready. This way your new configuration can be tested beforehand and verified working so that no issues will arise during migration. As most administrators know, over the years of managing a wireless network there might be a fair amount of built-up sludge in the network. Perhaps a WLAN that is no longer used or was prototyped but never put into production. Starting from scratch with AOS 8 gives the administrator the opportunity to remove this excess configuration from the environment, streamlining it.

# FIGURE 1 AOS 6 NETWORK DIAGRAM

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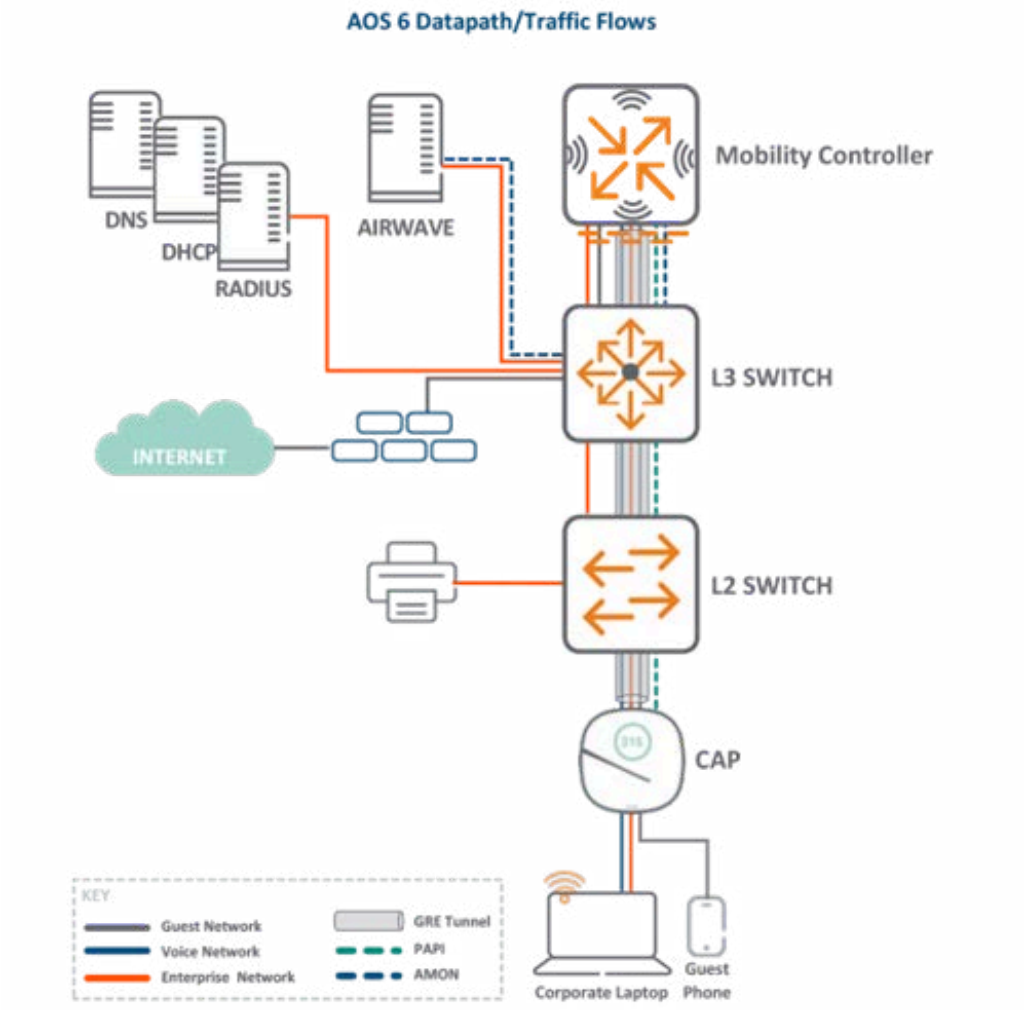
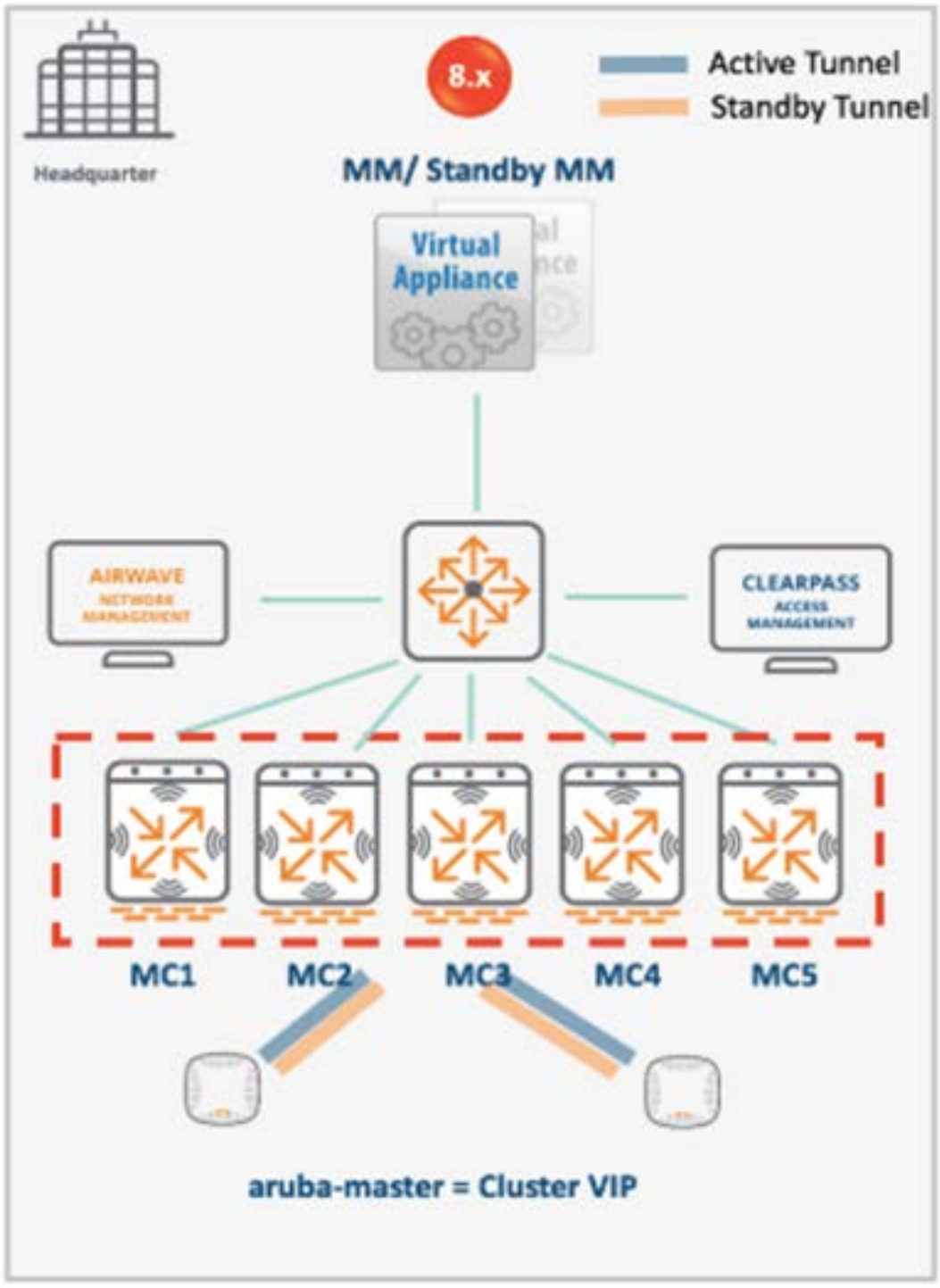



Taken from https://www.arubanetworks.com/techdocs/VSG/docs/035-campus-migrate/esp-campus-migrate-020-planning-aos6/

# FIGURE 2 AOS 8 NETWORK DIAGRAM

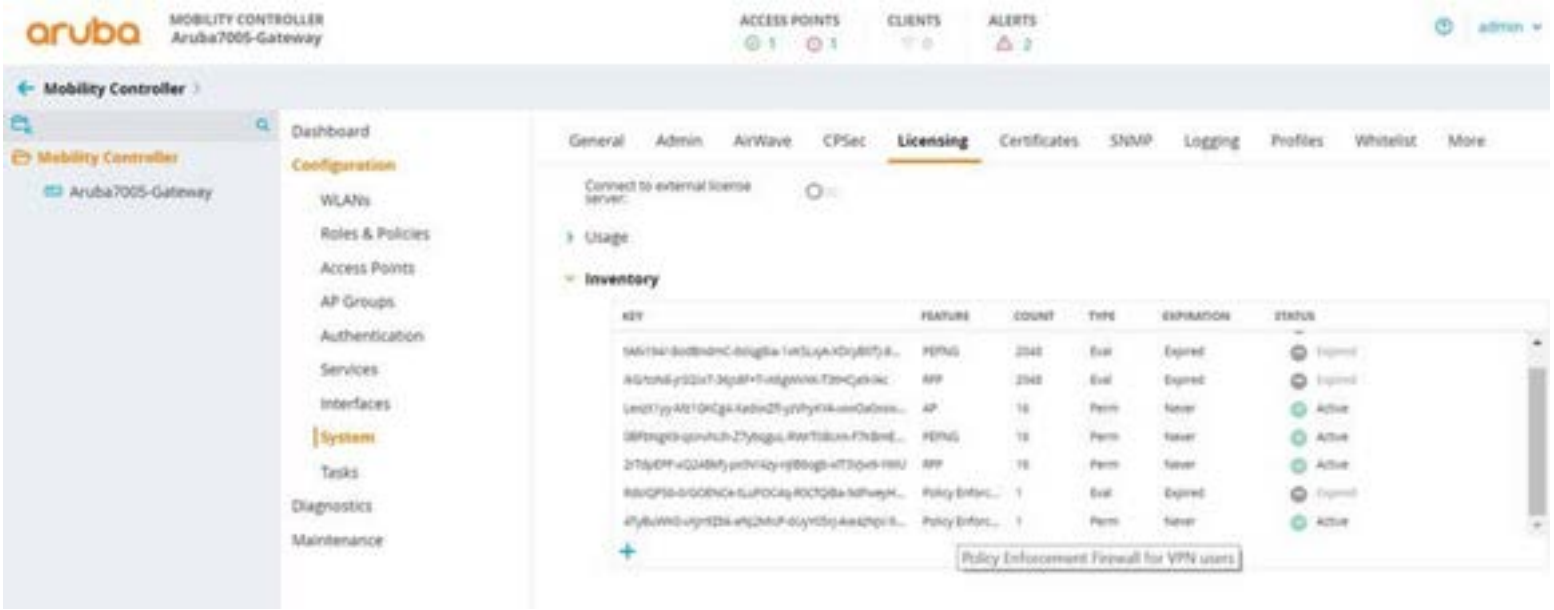



Taken from https://www.arubanetworks.com/techdocs/VSG/docs/035-campus-migrate/esp-campus-migrate-020-planning-aos6/
(uses old Mobility Master terminology instead of modern Mobility Conductor)

# AOS 8 GRAPHICAL USER INTERFACE

Aruba AOS 8 represents a bold venture into a more modern age of Wi-Fi services. First and foremost is its introduction of a new graphical user interface which provides a much more modern and easier to navigate view of the deployed Aruba wireless network. The GUI is similar in some ways to the previous one, in that the menu system is left side centric, with each option to choose from on the left. There are 3 options presented to include Dashboard, Configuration, and Maintenance. It is not the intention of this paper to provide a complete user guide for the AOS 8 GUI, so an overview will suffice for the various options under each option. Dashboard includes the option to view the entire infrastructure of the Wi-Fi network, including AP's and mobility controllers. This is also where you will find the IoT section, which is very helpful to those administrators who have large IoT deployments. Configuration is where the heavy lifting is done for building the wireless network. Here you will create WLAN's using a slick wizard which makes the process of creating a WLAN extremely painless and easy. Profiles, AP Groups, ports, and VLAN's are also built here. Maintenance is the final grouping of features and in here lies the ability to upgrade or downgrade the controller's AOS. Each item under the 3 options is presented in a clear and easy to understand fashion making it easy to navigate to where you need to be depending on your current need. Also, font sizes are bigger and bolder, much easier to read making the experience of using the GUI a much more user friendly and pleasant experience. It is a tremendous upgrade over the AOS 6 GUI experience, which was full of various menus and small font sizes making it challenging to read and interpret what was needed. With AOS 8 the information is presented in a more straight forward manner that allows an administrator to more readily digest the information they are looking for or build configurations with ease either by GUI or manually.

# FIGURE 3 AOS 8 GUI WITH CONFIGURATION OPTION DISPLAYED




# BENEFITS OF AOS 8

Without fail, there exist those administrators who may be hesitant to upgrade to AOS 8 as their AOS 6 environments are working fine and providing their users with the connectivity that they require. If it's not broke, why fix it they might say. This is a valid concern but is easily addressed by the easy-to-understand improvements made in AOS 8 that will greatly benefit any Wi-Fi network running AOS 6.

First and foremost, "ArubaOS 8 delivers unified wired and wireless access, seamless roaming, enterprise grade security, and a highly available network with the required reliability to support high density environments" ("Aruba AOS 8 Fundamental Guide"). With that in mind, some of the features of AOS 8 include the introduction of the mobility conductor, clustering of mobility controllers, AirMatch, Multizone, loadable service modules, security upgrades and many other smaller upgrades that we will not feature in this paper.

# MOBILITY CONDUCTOR

A mobility conductor is required to implement AOS 8 and take advantage of the new feature described in the previous paragraph. A Mobility Conductor is a standalone hardware device or virtual machine that provides a single point of configuration for an AOS 8 network. Instead of logging into each individual controller to perform configuration, the administrator logs into the Mobility Conductor and is granted access to view and configure all the controllers in the environment. This prevents the administrator from having to login to each individual controller to make a change in the environment. Since configurations are inherited from upper levels of the configuration hierarchy, changes may only need to be made in one location on the mobility conductor to create the change necessary across the environment. This is a huge improvement over the Master/Local setup of AOS 6. Another benefit of the Mobility Conductor is centralized licensing. Instead of having to load licenses on each individual controller for AP's and Firewall, licenses can all be loaded onto the Mobility Conductor where they are pooled together for use by every controller in the environment. This also applies to any licenses which are installed on the individual controllers as they are lumped in as part of the pool. In short, without a Mobility Conductor installed in the environment AOS 8 users won't be able to take advantage of the features that the Mobility Conductor unlocks like clustering, AirMatch, Multizone, and loadable service modules.

# CLUSTERING

The clustering of mobility controllers is a vital new feature of AOS 8. A "cluster is a combination of multiple managed devices working together to provide high availability to all the clients and ensure service continuity when a failover occurs" ("Aruba AOS 8.3 Web Help"). Clustering allows for a seamless failover to occur should one of the controllers in the cluster fail.This is accomplished by having the User's client build a tunnel to both a primary and backup controller in the cluster, so that if the primary controller fails the traffic just automatically shifts over to the standby controller, with no impact to the user so long as the controllers in the cluster are layer 2 connected. This also allows for upgrades to be done to a cluster without causing any downtime because as one controller in

the cluster reboots to complete the upgrade its clients will shift over to the other controller. This is a vast improvement in performance should a controller fail and provides tremendous versatility during the upgrade process, which no longer requires downtime. Clustering also provides for smooth roaming performance as the client will retain its IP address during the roaming process within the cluster. In addition to these features, clustering also allows for client and AP load balancing within the cluster. This ensures that none of the cluster members are overburdened with APs or clients causing potential performance issues. Another beneficial feature of clustering is that an AP can terminate on an entirely different cluster during a failure situation so long as the other clusters IP address is listed as the backup LMS IP in the configuration of the AP System profile

## AIRMATCH

Another impressive feature of AOS 8 is AirMatch, which is an upgrade to the existing ARM functionality of AOS 6. One of the biggest benefits to Air Match is that it uses the past 24 hours of RF data to make decisions on how to adjust settings to benefit the wireless network, which is in contrast to ARM which used only an instant snapshot of the current RF environment ("Aruba AOS 8.1 Web Help"). AirMatch also defaults to a deployment time of 5AM, to prevent any unnecessary interruptions to user traffic. Some settings that can be adjusted by AirMatch include channels, bandwidth by increasing or decreasing channel width, and power level (EIRP). Channels can be adjusted for a couple of main reasons which are, the presence of radar and a high level of noise on a current channel. Obviously, we cannot interfere with radar transmissions so that benefit is clear, but changing channel due to noise level can lead to an increased SNR (signal to noise ratio) which could lead to increased throughput and a better user experience. Increasing channel widths can create massive increases in throughput or in situations where channel widths need to be decreased this can create relief where there is CCI (co-channel interference). Finally, by adjusting power levels of the APs we can prevent sticky clients by reducing cell sizes which are created by lower power settings and in situations where an AP might fail, power can be increased to cover the gap in coverage created by the failure.

# MULTIZONE

Multizone is another substantial feature of AOS 8. Multizone allows for an individual AP to tunnel to 2 separate controllers, thus providing for separate entities to manage each controller and configure their own WLANs on each. Separate entities involve separate network structures, which also allows for the separation of networks. For example, in the Navy SIPR and NIPR are used as the classified and unclassified networks. With multizone they can coexist on the same AP's by defining a zone for each and within each zone a separate controller, one classified and one not. This is a massive improvement over previous solutions which often required a separate infrastructure for classified and unclassified networks or in many cases no network at all. Another use case for multizone is for a guest network. By creating a second zone for a guest network, guest traffic can be kept separate from corporate traffic on the same APs. This also works in situations where you have a government entity with their own traffic, but also contractors on site who need access to their own private networks. Multizone allows for each entity to have their own specific traffic handled separately from the others, allowing for much more flexibility in the way the network is designed.

# LOADABLE SERVICE MODULES

AOS 8 also allows for the use of loadable service modules. "The Loadable Service Module feature provides an infrastructure that allows users to dynamically upgrade or downgrade individual service modules without requiring an entire system reboot" ("Aruba OS 8.7 Web Help"). Loadable service modules include AirGroup, AppRF, ARM, AirMatch, and Unified communications manager. This feature allows for these modules to be upgraded or downgraded separate from the AOS itself and without requiring a reboot of the controller.

# SECURITY

AOS 6 does not offer WPA3 as a security option, while AOS 8 does. We will not go into depth on the benefits of WPA3 vs WPA2 except to say that the SAE (simultaneous authentication of equals) much improves the security of a PSK protected network and that the encryption available in WPA3 enterprise is up to 192-bit from 128-bit in WPA2, allows for more robust protection. WPA3 is the future of wireless security, and it is supported by AOS 8.

# PRE-UPGRADE CHECKS AND CONFIGURATION WORK

While it may seem simple, one of the most important aspects of upgrading to AOS 8 is to make sure that the existing controllers support AOS 8. Currently, the 9200, 9000, 7200, 7000, and Virtual Mobility Controllers all support AOS 8. If you are running something like a 3400 or earlier controller you will need to purchase a new controller to be able to run AOS 8.

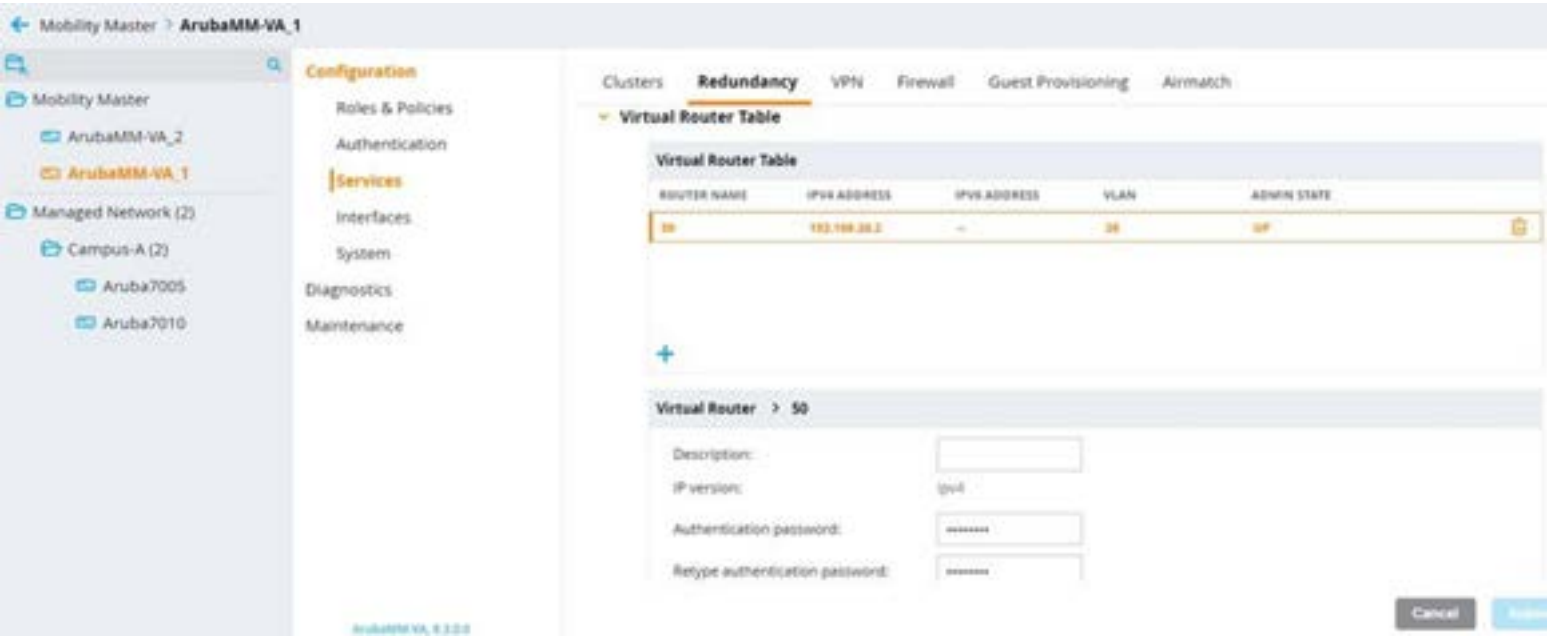
Another simple but often overlooked aspect of the upgrade process is to create backups of each master and local controller before upgrading. This way if something dramatic happens and the cutover to AOS 8 fails, this is unlikely but as we all know anything can happen, the administrator can fail back to the old AOS 6 configuration by rolling back the AOS to 6 and installing in the backups.

The first step in your upgrade path should be to purchase and install your Mobility Conductor, ideally a pair for redundancy. While we will not cover the details of how to configure the Mobility Conductor as there are guides out on the internet published by Aruba to allow for this sort of in depth look at what to do, we will cover the main topics of what needs to be done. If you have a pair of Mobility Conductors, you need to configure them to be redundant. This is done using one of two different methods, Layer 2 and layer 3 redundancy. Layer 2 redundancy requires that you obtain the VLAN ID for the primary and standby mobility conductor. They should be on the same layer 2 network. Also needed is the virtual IP address (VIP) that will be used for the VRRP (Virtual Router Redundancy Protocol). Configuring them in layer 2 is a simple matter that involves creating a new Virtual Router and then configuring the settings on that to include

IP address and authentication password. Layer 3 redundancy is similar in that it involves an active and standby Mobility Conductor or pair of Mobility Conductors. The conductors are connected via IPSEC tunnel and if one fails the other takes over with no user intervention ("Aruba OS 8.11.0 Web Help").

Once redundancy is established, the administrator can move on to configuring the managed network hierarchy. This is done via the left side of the screen under managed network.

## FIGURE 4 MANAGED NETWORK

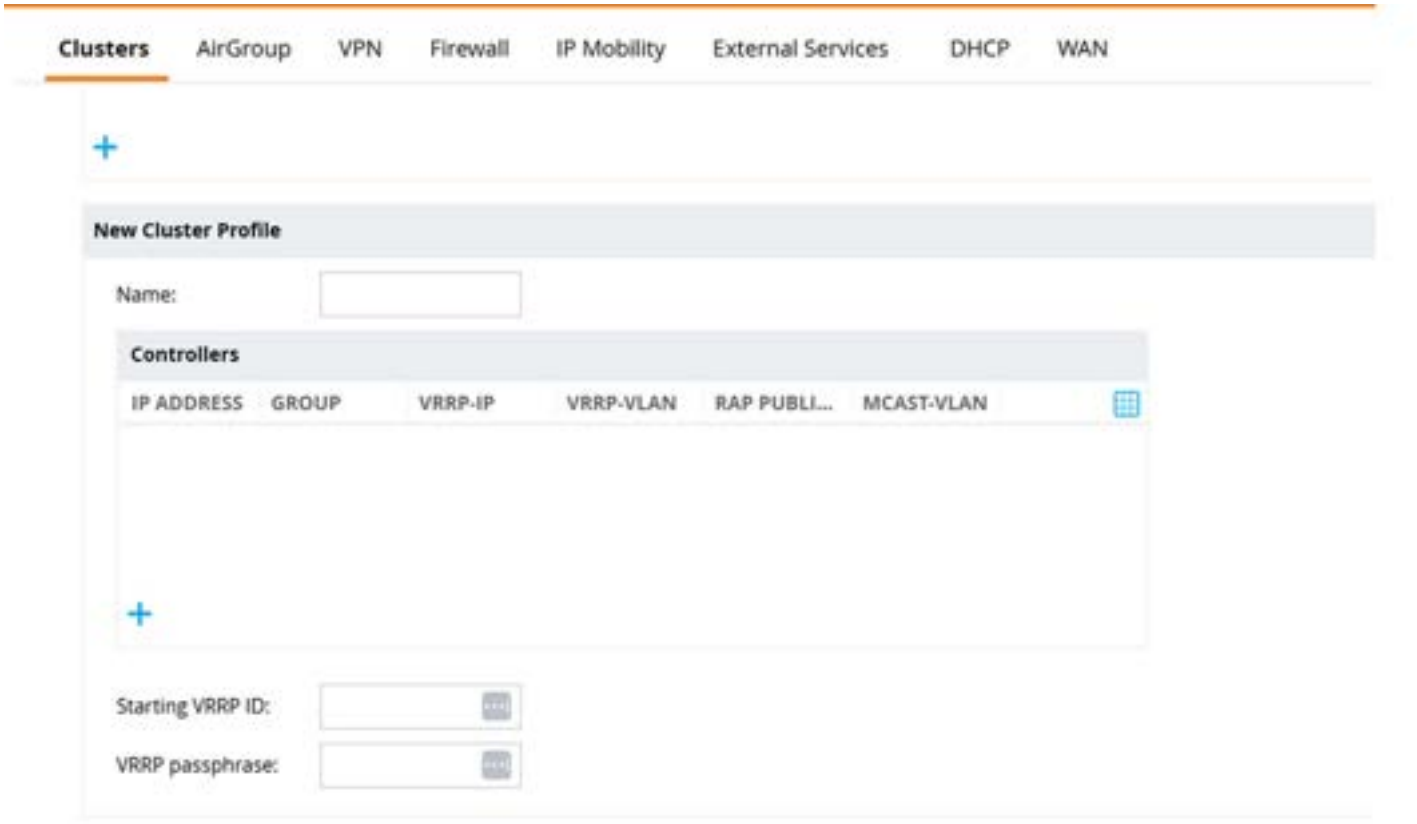



It is advisable to create an initial config level for the entire company, where you can configure the settings and features that will be present on all mobility controllers. This is because configuration is pushed down from the topmost level down on to the lowest level where the controllers live. Corporate WLAN and security settings would be configured here, along with VLANs. Moving down to the next level, regional configuration levels are created here. For example, a large corporation might have an East and West coast operational arm and so controllers need to be separated out into East and West coast. Again, settings can be configured at this level that would be present on all controllers under each

config level. At this point, it is possible to just have a controller present. Perhaps there is just one pair of controllers for the East Coast and one pair for the West Coast. Or perhaps you have multiple campuses on each coast, and you split up the next level into different campuses. Either way the point is eventually you arrive at a situation where you have the controllers present. They will appear once they are joined to the mobility conductor once they have been upgraded to AOS 8. You can then move the appropriate controller to the appropriate place on the Managed Network and then proceed to add any necessary configuration to them that is controller specific. Including clustering, VLAN's, etc. Adding clustering is a simple process that is shown via the below screen grabs from a lab controller.

## FIGURE 5 CLUSTER ADD

Figure 5 shows the view once the plus sign in figure 4 is clicked on. This is where your existing clusters are shown and where you go to add a new one, by clicking on the plus sign.



# FIGURE 6 CLUSTER ADD DETAIL

Figure six shows the window that pops up once you click on the plus sign in figure 4. This is where the cluster settings are configured.


VLANs live under the Interfaces section of the GUI, and adding one is a simple process. Just click on the plus sign and add a name and number for the VLAN.

# FIGURE 7 VLAN ADD

# TESTING AND MIGRATION

Once you have your configurations built up to your satisfaction it is time to test them out. To do this the easiest method is to upgrade one controller to AOS 8 and add it to the Mobility Conductor. If you do not have a spare controller it is advisable to purchase one. It does not have to be the same model you use in production, any 7000 series controller would do for this purpose as we are just testing a proof of concept that the network configuration actually works and does what is intended. Once the controller is added to the Mobility Conductor move on to the next step.

Next it is a best practice to move one individual AP over for testing purposes. This can be an AP located in a lab environment, which is ideal for ease of testing. Make sure that if you will not be doing the testing that whoever the tester is understands the vital nature of this testing. They must verify that they can connect to each SSID and then access resources as allowed by this SSID, be it corporate network files if connected to the corporate SSID or if connected to the Guest network that the tester can reach the internet successfully.

At this point it is time to migrate the controllers. Upgrade them to AOS 8. Delete any remaining configuration on them. And then join them to the Mobility Conductor. Once they are joined they will begin receiving the configuration built in the previous steps. It is recommended to move one controller per cluster, leaving the other controllers on AOS 6 with the AP's still terminated on them. Once you have one controller per cluster active in AOS 8 on the Mobility Conductor then move the AP's over to the controller on AOS 8. Once they have moved test them. If the test is successful, then move the remaining controllers over to AOS 8. Once the controllers are joined to the cluster the AP's will start load balancing so that you have an equally balanced number on each controller in the cluster.

# AFTER UPGRADE

If you have followed the steps outlined in this white paper, there should not be any issues after migration. However, it is always possible that something would be missed in the configurations so the administrator must be ready on the first day the users of the network are back in the office, be it the next morning or whenever. There are always little hiccups to deal with and it is important that you are prepared to do so in case they arise.

# CONCLUSION

Even though upgrading from AOS 6 to AOS 8 seems like a daunting task at first glance, the reality of the situation is that it is like any other large task. You must complete it one step at a time and plan your method of attack, whether you choose to use the Migration Tool or what I recommend which is a manual migration as outlined in this paper. Either way it is important to make sure you test and evaluate your progress after each step. Making sure that you are on the right track to success and also creating a stress-free upgrade path for yourself. If you do this, you will be well on your way to enjoying the many benefits of AOS 8 in your network.

**Melissa Rowland** | Global Account Executive (Sales) **melissa@cwnp.com** **cwnp.com**

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