HPE Aruba Partner Workshop

AOS8 Lab Guide

Group X

Rev. 1.4

AOS8 Partner Workshop

HPE Aruba Channel Partner Enablement

Introduction

Welcome to the Aruba OS8 Workshop. This workshop is intended to give partners a basic overview the new AOS v8.0 Mobility Solution in a concise lecture/lab format. Beyond this introductory workshop, it is recommended that partner engineers follow-up with formal training to build their presales and delivery skillsets for successful sales and deployments of Aruba Mobility solutions.

Lab exercises during in this workshop provide students a practical hands-on experience in configuration, operation, and maintenance of Aruba's Controllers and Campus Access Points (APs). They are designed to be executed on an Aruba Mobility Kit which consist of a Campus switch, 7005 Branch Controllers and AP205 APs.

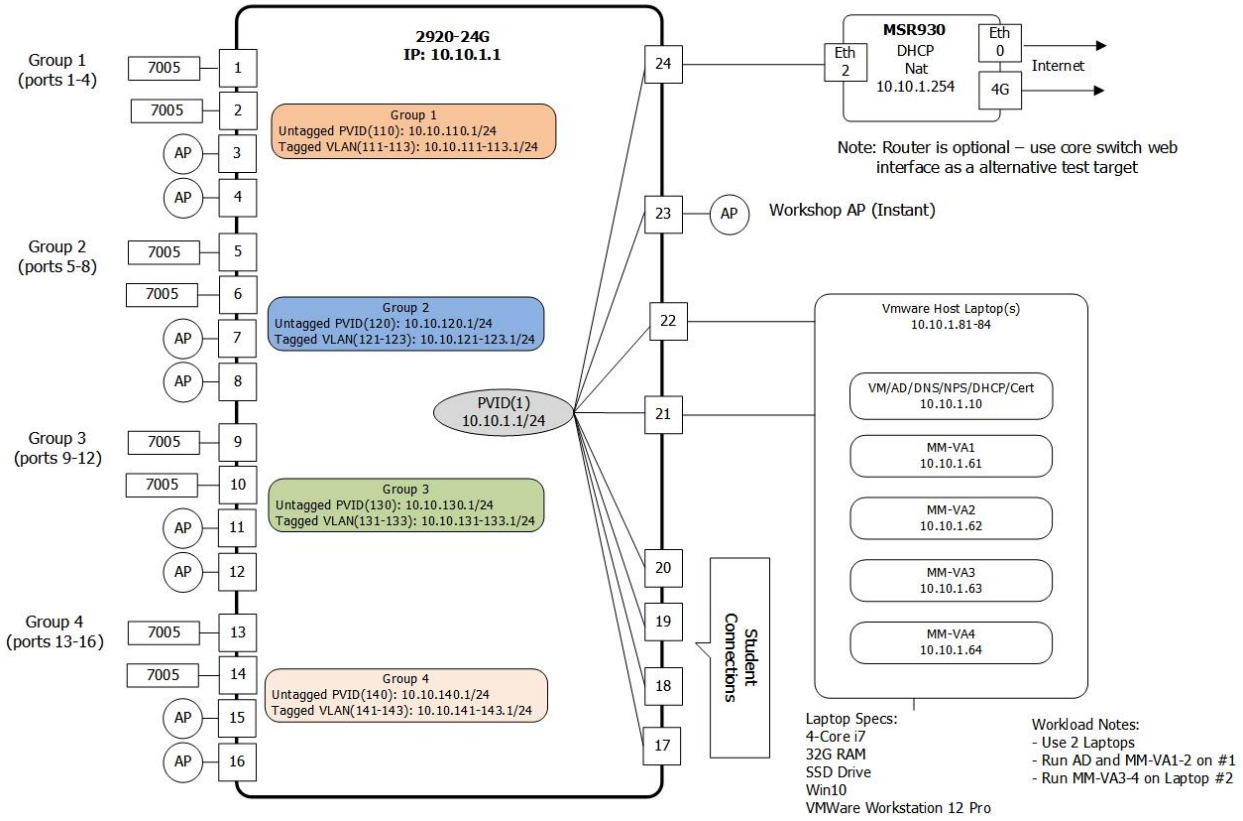
The labs build upon each other adding features and capabilities to build out a flexible and secure Aruba Mobile First environment. Student labs will start from a factory-default configuration and build a 2-node Managed Device Cluster utilizing the new Mobility Master feature to support Employee and Guest wireless services.

Physical Lab Setup

Below is a physical and logical diagram of the workshop environment. There may be slight variations in equipment models however, the functionality will be the same.

Figure 1

Mobility Kit 2920-24G



Lab 1 - Virtual Mobility Master (VMM) Initial Configuration

Goal:

Verify that your Mobility Master (virtual appliance) has been reset to factory default and existing licenses are intact. To save time, your MM has been pre-installed on your VMware server and licenses have been added.

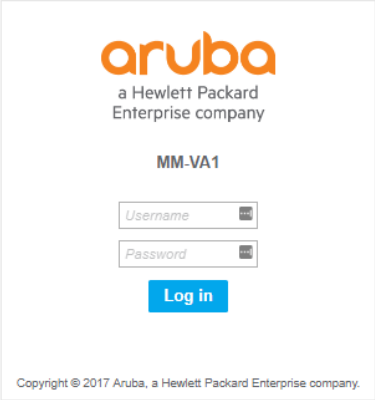
Task Summary:

- Login to your Mobility Master via web GUI .Check to see if there are any left-over configurations like controller and AP groups, WLAN definitions, etc.
- Verify licenses are pre-installed for your lab group.

Workflow:

- Connect to the workshop's WLAN:
  a. SSID=**workshop**
  b. PSK=**aruba123**

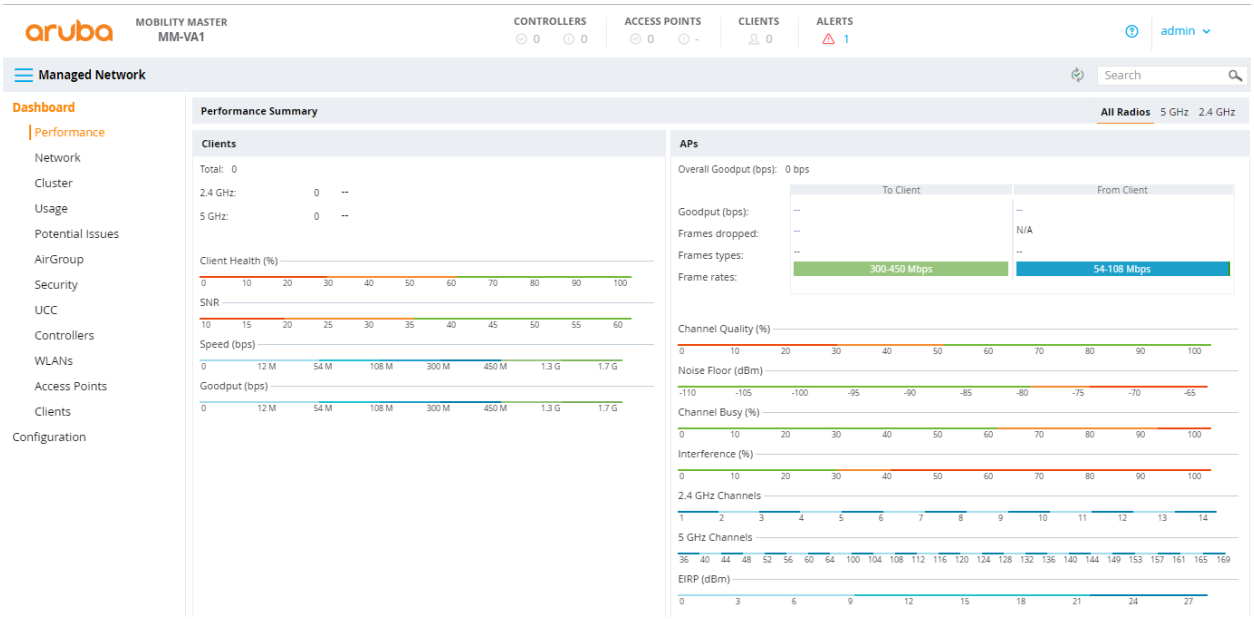
- Login to your Mobility Master
  a. **https://10.10.1.XX**
  b. UserID: **admin**
  c. Password: **aruba123**



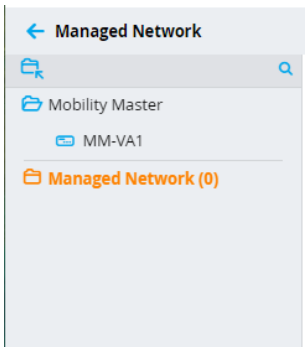
Mobility Master Dashboard

This is the Mobility Master Dashboard.

Open the Managed Network panel 



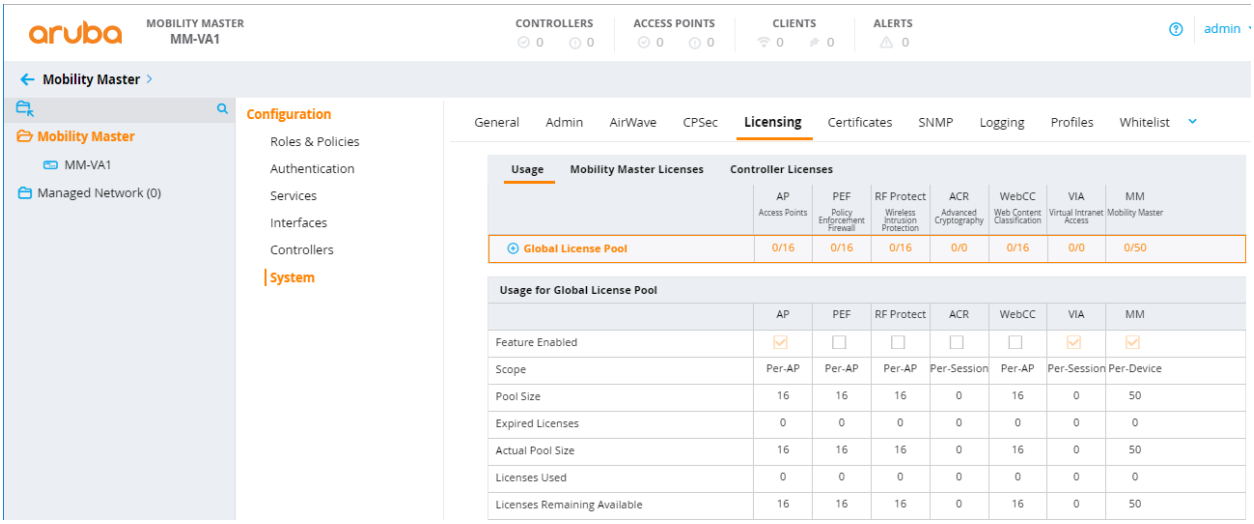
Verify that your Mobility Master has no configuration. The Managed Network folder should be empty as shown below. If there is a configuration on your Mobility Master, notify your instructor.



Enable Licenses

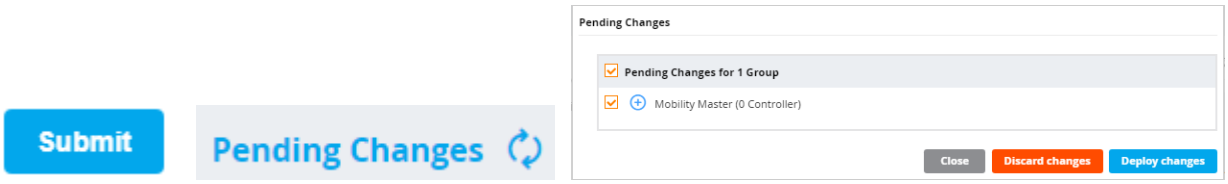
The following licenses have been installed on your Mobility Master: MM, AP, PEF, RF Protect & WebCC. You must also "enable" licenses to be consumed from the Global Licensing Pool.

- Navigate to: **Mobility Master→Configuration→System→Licensing→Usage**
- Click on **Global License Pool**

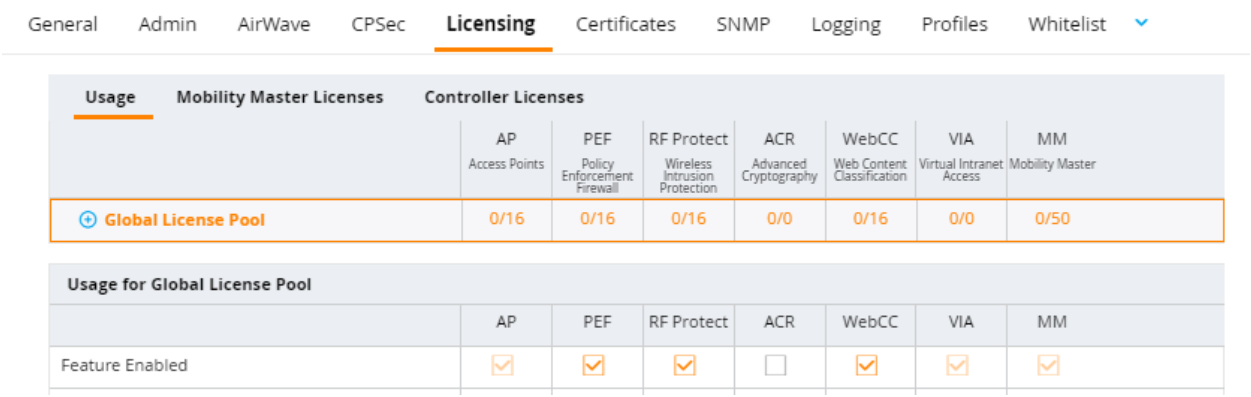


- Feature Enabled: **AP, PEF RF Protect WebCC**

Whenever you make changes to the MM configuration you must **Submit** the changes, click on **Pending Changes** & **Deploy changes** the changes for them to take effect.



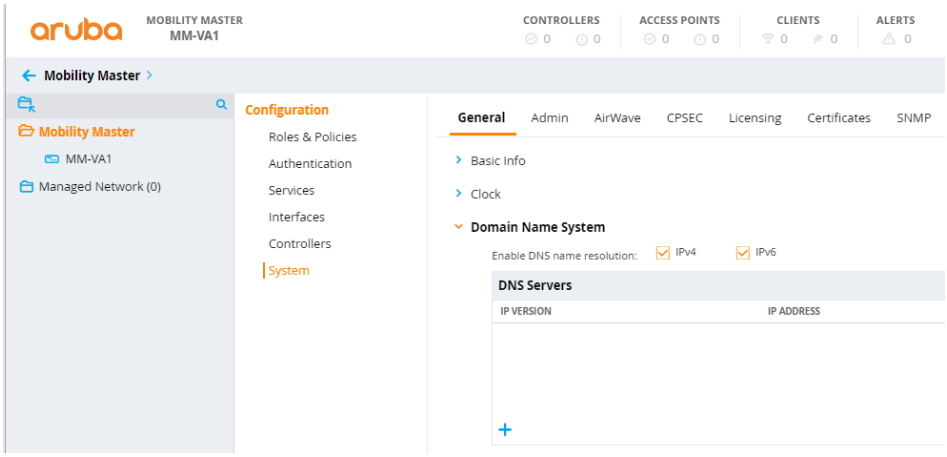
- Navigate to: **Usage→Global License Pool→Usage for Global License Pool.**
- Observe installed licenses that are enabled (checked)



DNS Configuration

The Workshop ADserver provides DNS services. Configure your Mobility Master to use the workshop's DNS server.

- Navigate to: **Mobility Master→Configuration→System→General→Domain Name System**
- Click **+**



- Add DNS Server: **10.10.1.10**
- Click **Submit**
- **Submit→Pending Changes→Deploy changes**

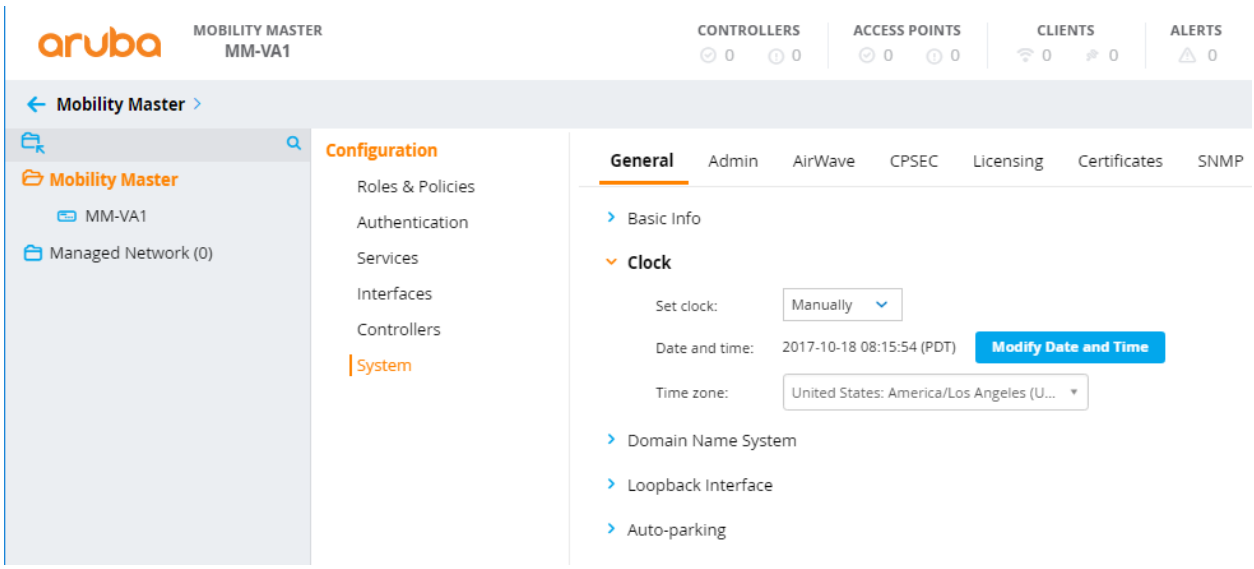
System Clock

Next, verify the date, time and time-zone are correctly set on your system clock. Clock settings are set on each individual MM system. Because we will be using Microsoft NPS for 802.1X authentications, your MM time must match the time of the workshop's AD server within 5 minutes. The Workshop's AD server is set to Pacific Time Zone.

- Navigate to: **Mobility Master→MM-VAX→System→General→Clock**

If you make changes to the system time:

- **Submit→Pending Changes→Deploy changes**



Lab 2 – 7005 Controller Factory Reset

Goal:

Reset 7005 Controller(s) to factory default settings and provision with IP Address, Interfaces and VLAN settings.

Task Summary:

- Connect your assigned controllers to the lab switch.
- Connect serial console to your assigned controller.
- Use Web GUI or CLI to do a factory reset
- Run the setup script (full-setup) to configure your controllers as an MD (managed device)

Workflow:

7005-X Controller Factory Reset

Reset your 1st controller (7005-X) to factory default and run the initial script.

- `User: admin`
- `Password: aruba123`
- `(7005-X) >enable`
- `Password: enable`
- `(Aruba7005) #write erase`
- `Switch will be factory defaulted. All the configuration and databases will be deleted.`
- `Press 'y' to proceeed: y`
- `Write Erase successful`

- `(Aruba7005) #reload`
- `Do you really want to restart the system(y/n): y`

  The controller will reboot.

7005-X System Startup Script

- Configure your controller via console cable using the “full-setup” configuration script at the end of the boot sequence.

```
Auto-provisioning is in progress. It requires DHCP and Activate servers
Choose one of the following options to override or debug auto-provisioning...
    'enable-debug'  : Enable auto-provisioning debug logs
    'disable-debug' : Disable auto-provisioning debug logs
    'mini-setup'    : Start mini setup dialog. Provides minimal customization and requires DHCP
server
    'full-setup'    : Start full setup dialog. Provides full customization

Enter Option (partial string is acceptable): full-setup

Are you sure that you want to stop auto-provisioning and start full setup dialog? (yes/no): yes

***************** Welcome to the Aruba7005 setup dialog *****************
This dialog will help you to set the basic configuration for the switch.
These settings, except for the Country Code, can later be changed from the
Command Line Interface or Graphical User Interface.


Commands: <Enter> Submit input or use [default value], <ctrl-I> Help
<ctrl-B> Back, <ctrl-F> Forward, <ctrl-A> Line begin, <ctrl-E> Line end
<ctrl-D> Delete, <BackSpace> Delete back, <ctrl-K> Delete to end of line
<ctrl-P> Previous question <ctrl-X> Restart beginning <ctrl-R> Reload box


Enter System name [Aruba7005]: 7005-X
Enter Switch Role (standalone|md) [md]:
Enter IP type to terminate IPSec tunnel (ipv4|ipvX) [ipv4]:
Enter Master switch IP address or FQDN: 10.10.1.XX
Is this a VPN concentrator for managed device to reach Master switch (yes|no) [no]:
This device connects to Master switch via VPN concentrator (yes|no) [no]:
Is Master switch Virtual Mobility Master? (yes|no) [yes]:
Master switch Authentication method (PSKwithIP|PSKwithMAC) [PSKwithIP]:
Enter IPSec Pre-shared Key: secret
Re-enter IPSec Pre-shared Key: secret
Do you want to enable L3 Redundancy (yes|no) [no]:
Enter Uplink Vlan ID [1]: 1X0
Enter Uplink port [GE 0/0/0]:
Enter Uplink port mode (access|trunk) [access]: trunk
Enter Native VLAN ID [1]: 1X0
Enter Uplink Vlan IP assignment method (dhcp|static) [static]:
Enter Uplink Vlan Static IP address [172.16.0.254]: 10.10.1X0.101
Enter Uplink Vlan Static IP netmask [255.255.255.0]:
Enter IP default gateway [none]: 10.10.1X0.1
Enter DNS IP address [none]: 10.10.1.10
Do you wish to configure IPV6 address on vlan (yes|no) [yes]: no
Do you want to configure dynamic port-channel (yes|no) [no]:
This controller is restricted, please enter country code (US|PR|GU|VI|MP|AS|FM|MH) [US]: US
You have chosen Country code US for United States (yes|no)?: yes
Enter the controller's IANA Time zone [America/Los_Angeles]:
Enter Time in UTC [17:25:37]:
Enter Date (MM/DD/YYYY) [7/12/2017]:
Do you want to create admin account (yes|no) [yes]:
Enter Password for admin login (up to 32 chars): aruba123
Re-type Password for admin login: aruba123

Note: These settings require IP-Based-PSK configuration on Master switch
If you accept the changes the switch will restart!
Type <ctrl-P> to go back and change answer for any question
Do you wish to accept the changes (yes|no)yes
Creating configuration... Done.
System will now restart!
```

7005-XX Controller Factory Reset

Reset your 2nd controller (7005-XX) to factory default and run the initial script.

- User: **admin**
- Password: **aruba123**
- (7005-X) >**enable**
- Password: **enable**
- (Aruba7005) #**write erase**
- Switch will be factory defaulted. All the configuration and databases will be deleted.
- Press 'y' to proceeed: **y**
- Write Erase successful

- (Aruba7005) #**reload**
- Do you really want to restart the system(y/n): **y**

  The controller will reboot.

7005-XX System Startup Script

Configure your controller via console cable using the “full-setup” configuration script at the end of the boot sequence.

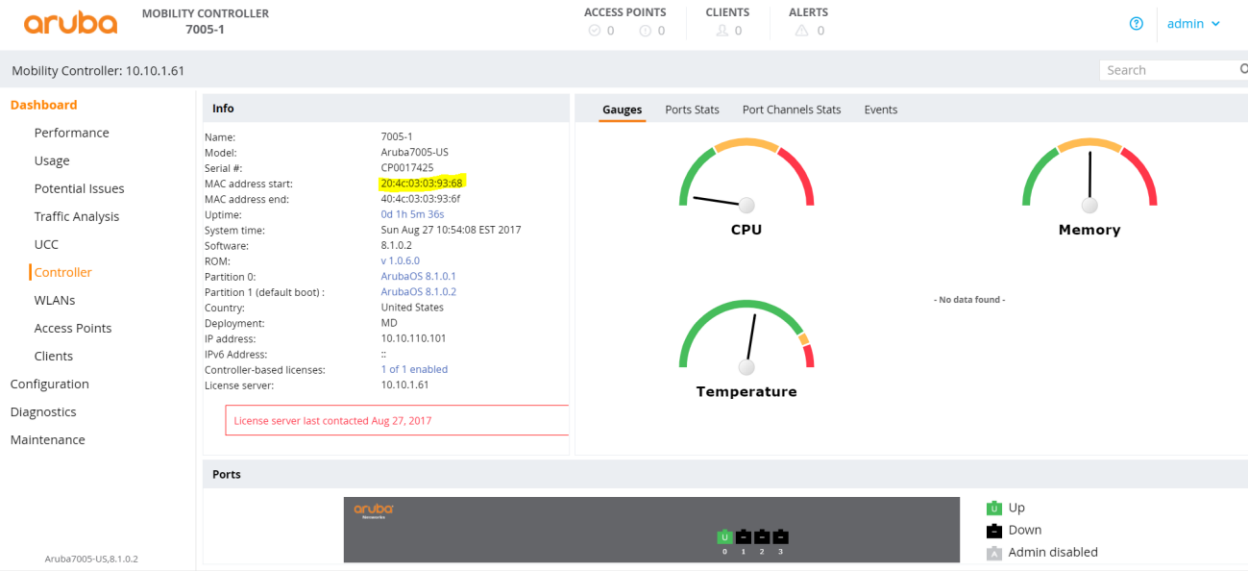
```
Auto-provisioning is in progress. It requires DHCP and Activate servers
Choose one of the following options to override or debug auto-provisioning...
    'enable-debug'  : Enable auto-provisioning debug logs
    'disable-debug' : Disable auto-provisioning debug logs
    'mini-setup'    : Start mini setup dialog. Provides minimal customization and requires DHCP
server
    'full-setup'    : Start full setup dialog. Provides full customization

Enter Option (partial string is acceptable): full-setup

Are you sure that you want to stop auto-provisioning and start full setup dialog? (yes/no): yes

***************** Welcome to the Aruba7005 setup dialog *****************
This dialog will help you to set the basic configuration for the switch.
These settings, except for the Country Code, can later be changed from the
Command Line Interface or Graphical User Interface.


Commands: <Enter> Submit input or use [default value], <ctrl-I> Help
<ctrl-B> Back, <ctrl-F> Forward, <ctrl-A> Line begin, <ctrl-E> Line end
<ctrl-D> Delete, <BackSpace> Delete back, <ctrl-K> Delete to end of line
<ctrl-P> Previous question <ctrl-X> Restart beginning <ctrl-R> Reload box


Enter System name [Aruba7005]: 7005-XX
Enter Switch Role (standalone|md) [md]:
Enter IP type to terminate IPSec tunnel (ipv4|ipv6) [ipv4]:
Enter Master switch IP address or FQDN: 10.10.1.XX
Is this a VPN concentrator for managed device to reach Master switch (yes|no) [no]:
This device connects to Master switch via VPN concentrator (yes|no) [no]:
Is Master switch Virtual Mobility Master? (yes|no) [yes]:
Master switch Authentication method (PSKwithIP|PSKwithMAC) [PSKwithIP]:
Enter IPSec Pre-shared Key: secret
Re-enter IPSec Pre-shared Key: secret
Do you want to enable L3 Redundancy (yes|no) [no]:
Enter Uplink Vlan ID [1]: 1X0
Enter Uplink port [GE 0/0/0]:
Enter Uplink port mode (access|trunk) [access]: trunk
Enter Native VLAN ID [1]: 1X0
Enter Uplink Vlan IP assignment method (dhcp|static) [static]:
Enter Uplink Vlan Static IP address [172.16.0.254]: 10.10.1X0.102
Enter Uplink Vlan Static IP netmask [255.255.255.0]:
Enter IP default gateway [none]: 10.10.1X0.1
Enter DNS IP address [none]: 10.10.1.10
Do you wish to configure IPV6 address on vlan (yes|no) [yes]: no
Do you want to configure port-channel (yes|no) [no]:
This controller is restricted, please enter country code (US|PR|GU|VI|MP|AS|FM|MH) [US]: US
You have chosen Country code US for United States (yes|no)?: yes
Enter the controller's IANA Time zone [America/Los_Angeles]:
Enter Time in UTC [17:25:37]:
Enter Date (MM/DD/YYYY) [7/12/2017]:
Do you want to create admin account (yes|no) [yes]:
Enter Password for admin login (up to 32 chars): aruba123
Re-type Password for admin login: aruba123

Note: These settings require IP-Based-PSK configuration on Master switch
If you accept the changes the switch will restart!
Type <ctrl-P> to go back and change answer for any question
Do you wish to accept the changes (yes|no)yes
Creating configuration... Done.
System will now restart!full
```

The 7005 controller takes approximately 10 minutes to reload. After controllers reboot with new settings, verify connectivity via web browser:

- 7005-1: **https://10.10.1X0.101**
- 7005-11**:** **https://10.10.1X0.102**

The controller's MAC address is used if you manually add your controller to your Mobility Master. The controller's MAC address is the first address allocated in the controller and is shown in the "MAC address start" field. In the next lab, we will leverage the "auto-park" feature to automatically add each controller to your MM group folder.

- Navigate to: Dashboard→Controller



Lab 3 – Adding Controllers to Mobility Master

Goal:

Configure your Mobility Master (MM) to discover your two controllers configured in the previous lab.

Task Summary:

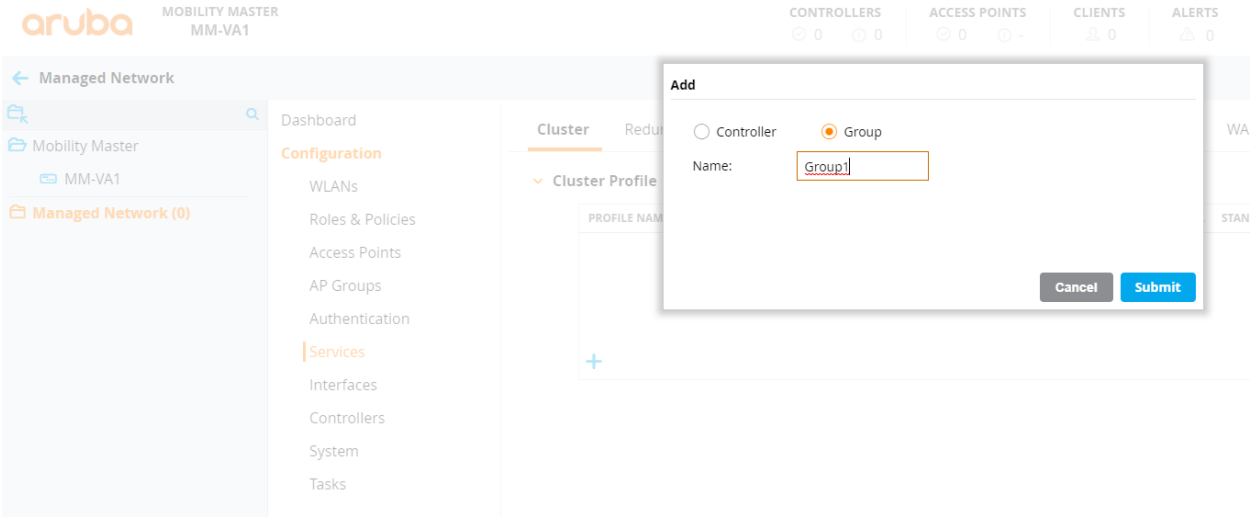
- Login to your Virtual Mobility Master (VMM) via GUI.
- Create a controller Group in your Managed Network Folder.
- Configure IPsec and Auto-Park to automate Managed Device adoption
- Verify controller connectivity.

Workflow:

Managed Network Node

Create Managed Network Node:

- Login to your Mobility Master: **https://10.10.1.XX**
- Navigate to: **Managed Network**
- Click +
- Add: **Group**
- Name: **GroupX**
- Click **Submit**

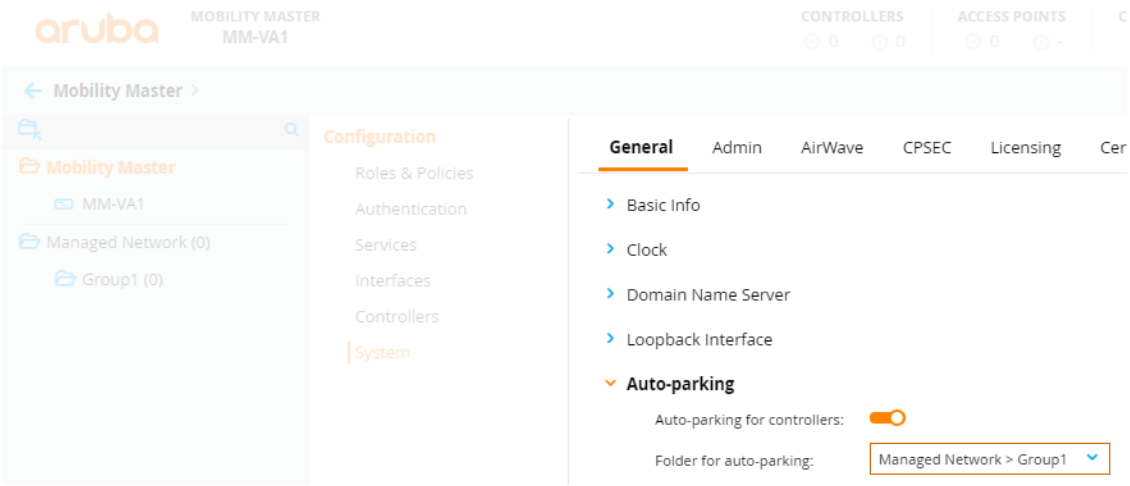


Auto-Park

To automate Controller (managed device) adoption and assignment to a group, you need to set up a default entry for IPsec keys (for communication) and enable Auto-Park to automatically place discovered controllers in your MM Group folder.

Enable Auto-parking

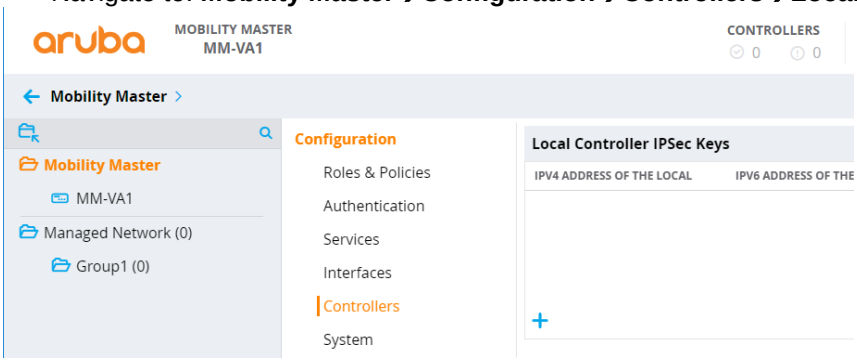
- Navigating to: **Mobility Master→ Configuration→System→General→Auto-parking**
- Enable Auto-parking
- Folder for auto-parking: **Managed Network > GroupX**
- Click **Submit**



Configure IPSEC Keys

To establish IPsec communication between your MM and your controllers (managed devices) configure IPSEC keys. Note that this must match the IPSec Pre-shared Key that you specified in the startup script for your 7005 controllers.

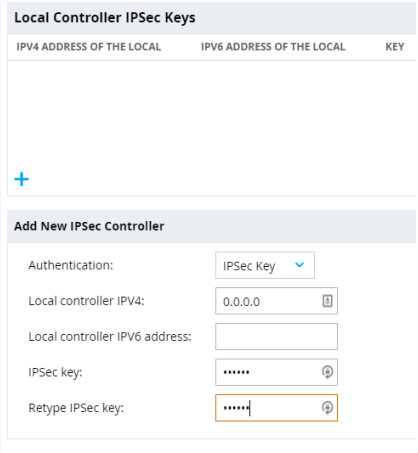
- Navigate to: **Mobility Master→Configuration→Controllers→Local Controller IPsec Keys**



You can specify IP addresses for which controllers can Auto Park. Here we match all controller IP addresses vs specific IP addresses.

- Click **+**
- Local Controller IPV4: **0.0.0.0**

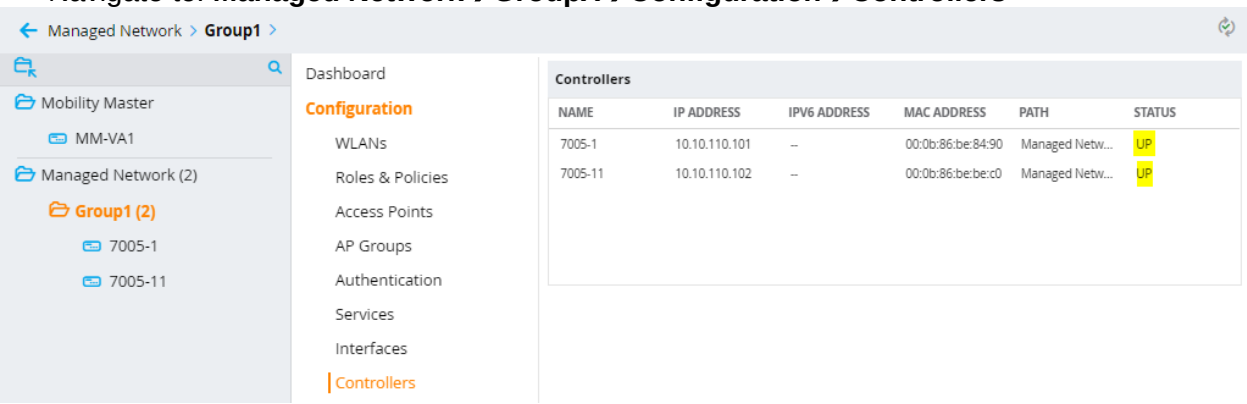
- IPsec Key: ***secret***
- Retype IPsec Key: ***secret***



- Click **Submit, Pending Changes, Deploy Changes**

Verify controller discovery/connection to verify the controllers appear in the MM and are auto-parked into your MM group folder. Note: it can take up to 10 minutes to establish communications and auto-park your MD in your Managed Network Group.

- Navigate to: **Managed Network→GroupX→Configuration→Controllers**

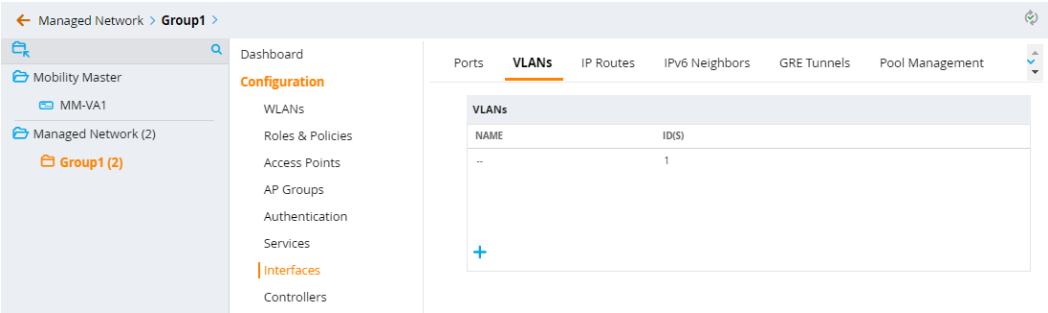


VLAN Configuration

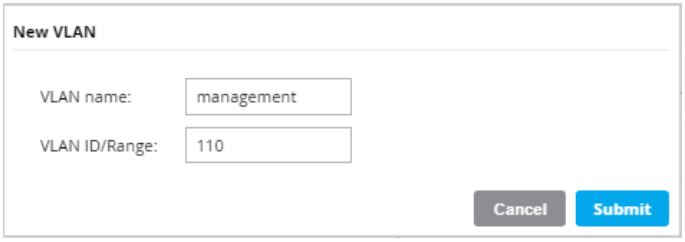
We will need several VLANs to separate traffic for different services. The table below lists the VLANs that will be required as well as their interface and port settings. We will configure VLANs once at the Group level. Both controllers will inherit the VLAN configuration from the GroupX folder.

VLAN Assignments					
Name	ID	IP/Mask	802.1q	Forwarding	Access
management	1X0	10.10.1X0.0/24	Untagged	L2	None
guest	1X1	10.10.1X1.0/24	Tagged	L2	Open
employee	1X2	10.10.1X2.0/24	Tagged	L2	RADIUS
finance	1X3	10.10.1X3.0/24	Tagged	L2	RADIUS/RBAC

- Navigate to: **Managed Networks→GroupX→Configuration→Interfaces→VLANS**
- Click **+**



- Create these VLAN names and ID's based on this table for your group. Note that VLAN names are **case sensitive**, so you should enter them in as shown in the table.



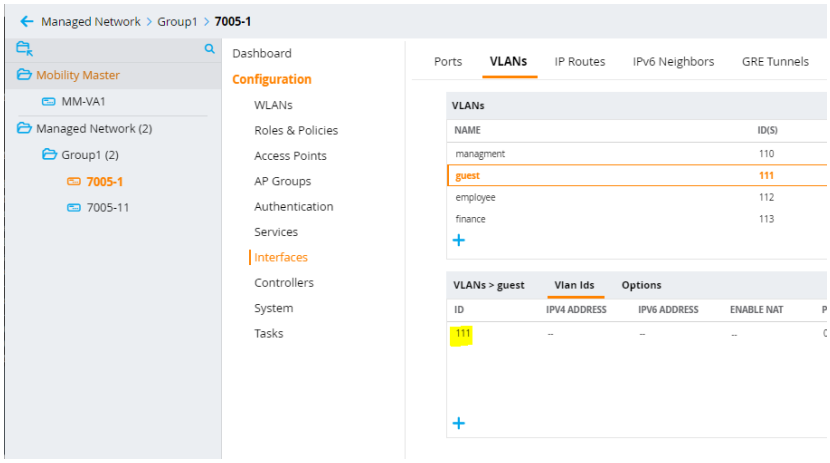
- Click **Submit, Pending Changes, Deploy Changes**

When you are finished, the VLAN configuration should be similar to the one shown for GroupX below.

Guest VLAN Configuration

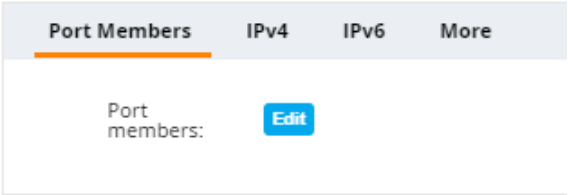
The guest VLAN (1X1) utilizes a captive portal which requires an IP interface on each controller. Note that the guest VLAN is inherited from the Group level. IP interfaces must be configured at the Managed Device level because they are unique to each device. In this case controllers 7005-X and 7005-XX will have different IP address therefore they must be configured separately.

- Navigate to **Managed Network→GroupX→7005-X→Configuration→Interfaces→VLANs**
- Click **guest→1X1**

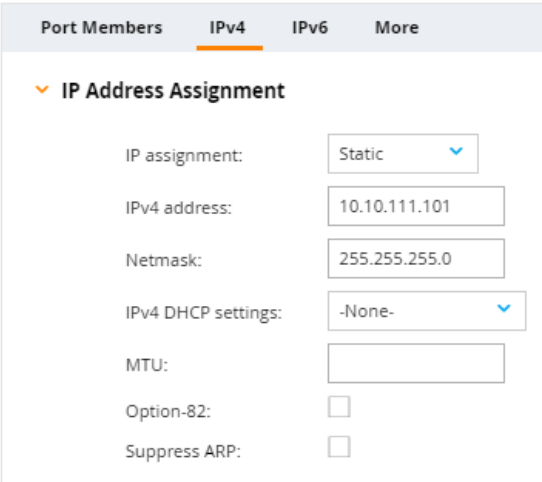


A panel which allows you to configure the VLAN interface appears. To configure an IP interface click on the IPv4 icon.

- Click: **IPv4**



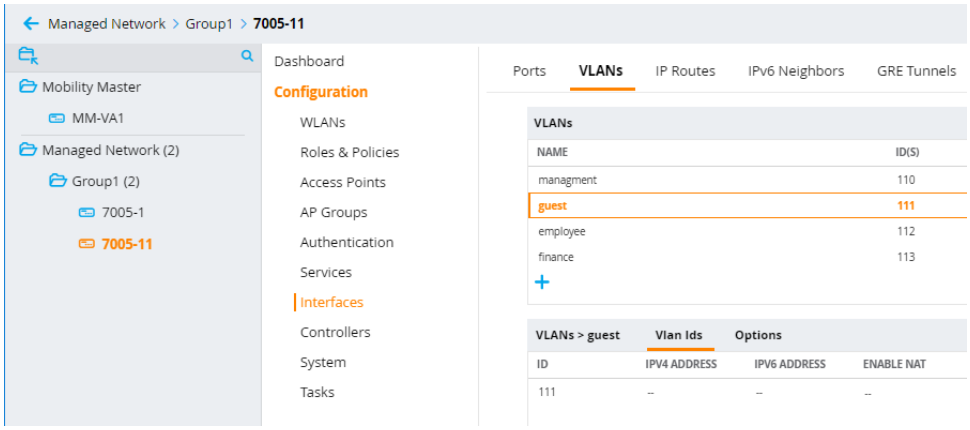
- IP assignment: **Static**
- IPv4 address: **10.10.1X1.101**
- Netmask: **255.255.255.0**
- IPv4 DHCP settings: **none**



- Click: **Submit, Pending Changes, Deploy Changes**

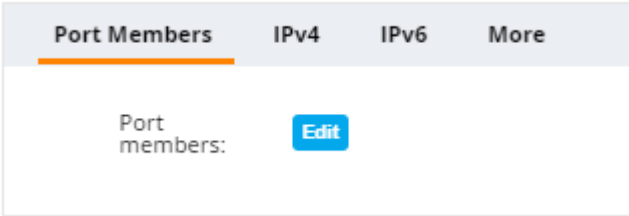
Repeat the IP interface configuration for Controller 7005-XX.

- Navigate to **Managed Network→GroupX→7005-XX→Configuration→Interfaces→VLANs**
- Click **guest→1X1**

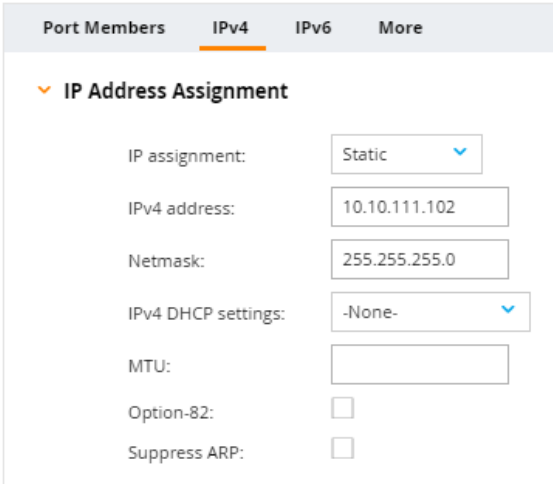


A panel which allows you to configure the VLAN interface appears. To configure an IP interface, click on the IPv4 icon.

- Click: **IPv4**



- IP assignment: **Static**
- IPv4 address: **10.10.1X1.102**
- Netmask: **255.255.255.0**
- IPv4 DHCP settings: **none**



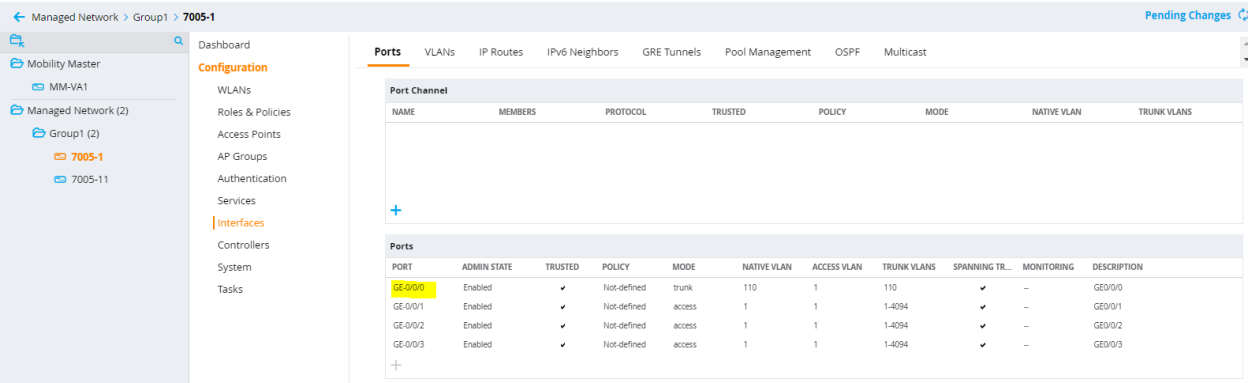
- Click: **Submit, Pending Changes, Deploy Changes**

Port Configuration

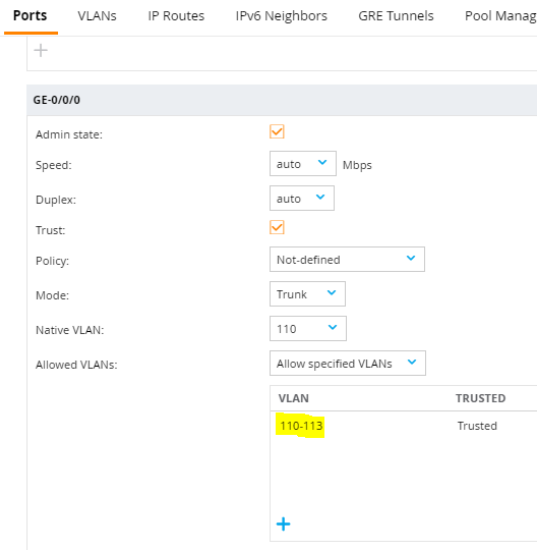
Configure controller port GE-0/0/0 as a trunk, specifying the native VLAN and the additional VLANS we created in the previous step. Due to potential differences in controller hardware, we will perform this configuration on each individual controller (not at the group level).

Configure ports for 7005-X:

- Navigate to: **Managed Networks→GroupX→7005-X→Configuration→Interfaces→Ports**
- Click **GE-0/0/0**



- Allowed VLANs: **Allow specific VLANS**
- Click **+**
- Add VLANs **1X1, 1X2, 1X3**



When you are returned to the GE-0/0/0 Port panel, review the port settings:

- Mode: Trunk
- Native VLAN 1X0
- Allowed VLANs: Allow specified VLANs
    - VLANs 1X0 – 1X3 Trusted
- Click **Submit, Pending Changes, Deploy Changes**

Ports

PORT	ADMIN ST...	TRUSTED	POLICY	MODE	NATIVE VL...	ACCESS VL...	TRUNK VL...	SPANNIN...	MONITORI...	DESCRIPTI...
GE-0/0/0	Enabled	✔	Not-defined	trunk	110	1	110-113	✔	--	GE0/0/0

- **Repeat the previous steps for your second controller 7005-XX**

When you are finished your Port configuration should be the same as your first controller.

Ports

PORT	ADMIN ST...	TRUSTED	POLICY	MODE	NATIVE VL...	ACCESS VL...	TRUNK VL...	SPANNIN...	MONITORI...	DESCRIPTI...
GE-0/0/0	Enabled	✔	Not-defined	trunk	110	1	110-113	✔	--	GE0/0/0

Lab 4 – Building a Controller Cluster

Goal:

Build a controller cluster for your two controllers.

Task Summary:

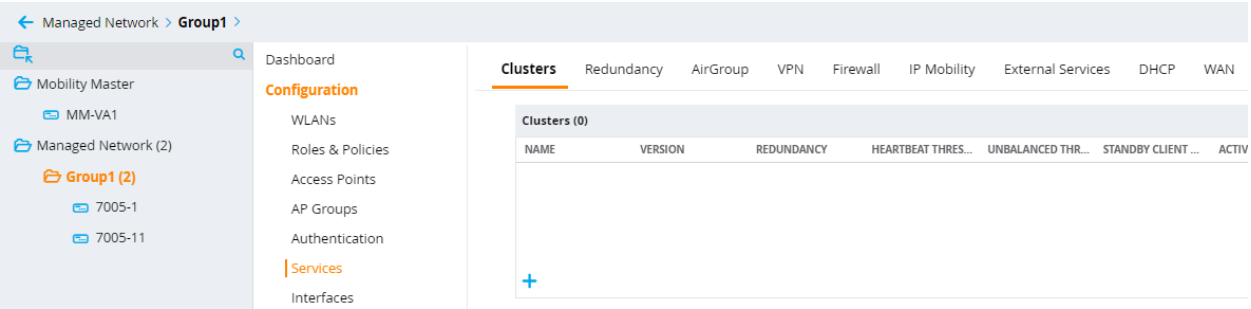
- Login to your Virtual Mobility Master (VMM)
- Create a Cluster Profile
- Assign controllers to your profile
- Verify that your cluster has formed a Layer 2 Cluster

Workflow:

Cluster Profile

Create a new cluster profile.

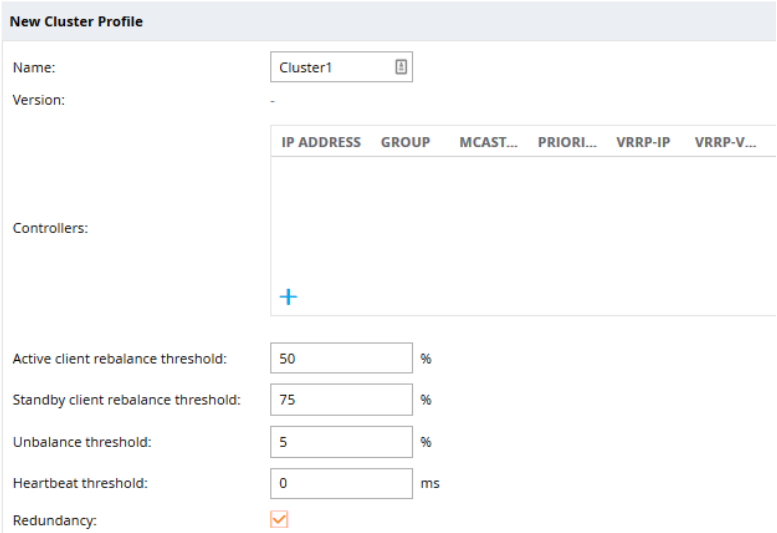
- Login into your Mobility Master: **https://10.10.1.XX**
- Navigate to: **Managed Network→Group X→Configuration→Services→Clusters**
- Click +



Give the cluster profile a name and add your 7005 controllers.

- Name: **ClusterX**
- In the Controllers section

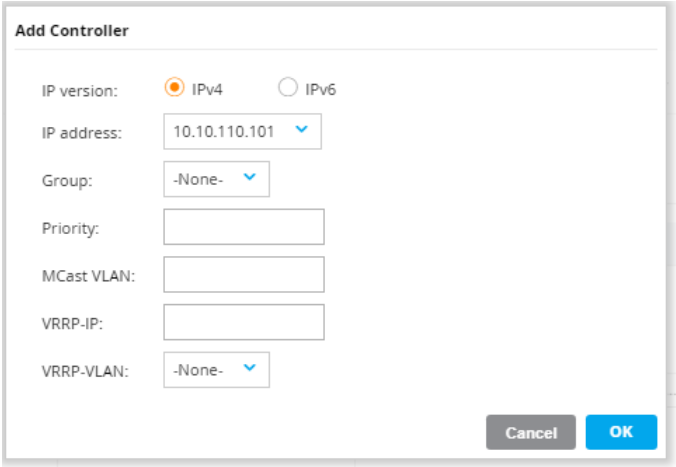
  Click +



Add 7005-X & 7005-XX IP addresses to the list of controllers. This is essentially a whitelist of controllers that will be allowed to be members of this cluster.

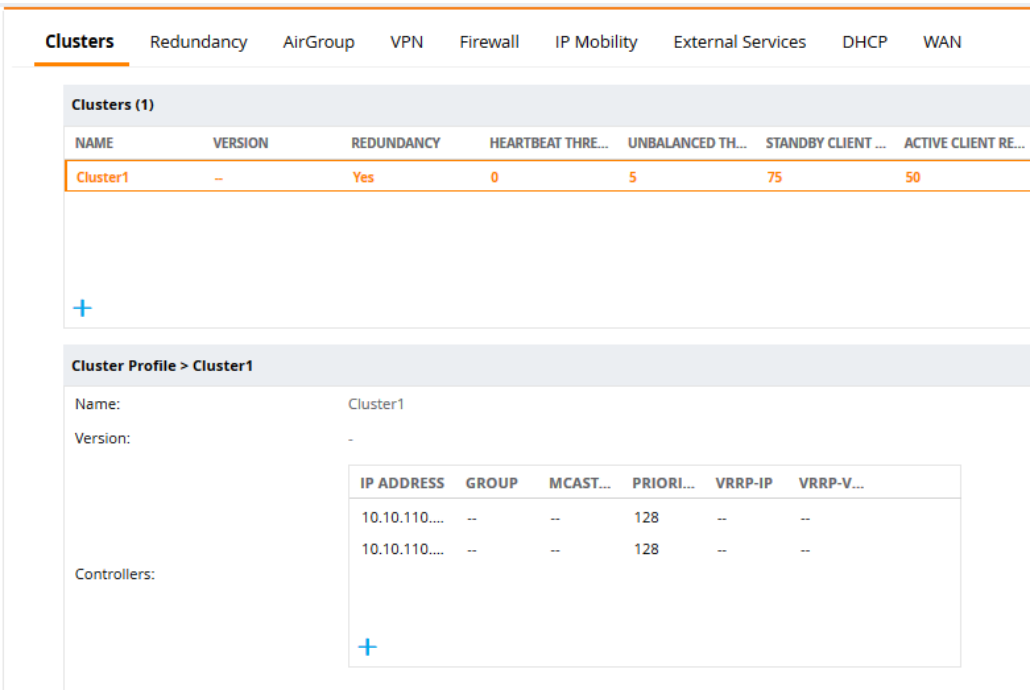
Add Controller

- IP version: **IPv4**
- Controller IPv4: **10.10.1X0.101**
- Click **OK**
- Controllers IPv4: Click **+**
- Controller IPv4: **10.10.1X0.102**
- Click **OK**



- Click: **Submit, Pending Changes, Deploy Changes**

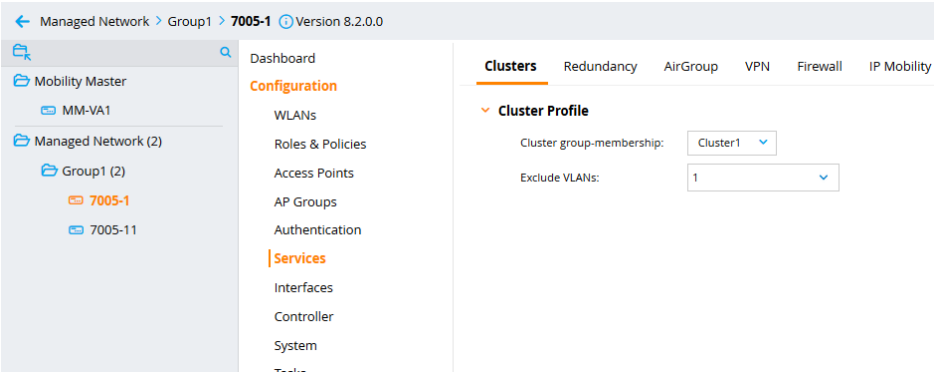
When you are returned to the Cluster page, verify that both of your controllers are in the list.



Controller Membership

Assign individual controllers to the Cluster profile we built in the previous step. **Important Note:** To insure our cluster forms a Layer 2 cluster, we have to exclude any VLANs that are not Layer-2 connected to other members of the cluster. Each member sends a broadcast probe on each VLAN defined in the cluster to verify L2 connectivity. This is important to maintain AP and client state synchronization within your cluster and avoid a client de-authorization should a cluster member fail.

- Navigate to: **Managed Network→GroupX→7005-X→Configuration→Services→Clusters**
    - **Cluster Profile**
        - Cluster group membership: **ClusterX**
        - Exclude VLANs: **1**
- Click: **Submit, Pending Changes, Deploy Changes**

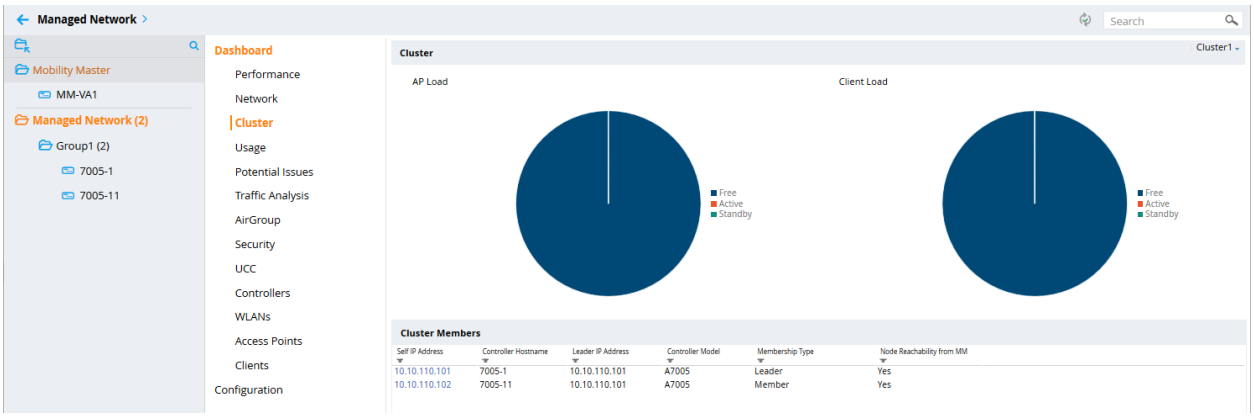


Repeat for your second controller:

- Navigate to: **Managed Network→GroupX→7005-XX→Configuration→Services→Cluster**
    - **Cluster Profile**
        - Cluster group membership: **ClusterProfile**
        - Exclude VLANs: **1**
- Click: **Submit, Pending Changes, Deploy Changes**

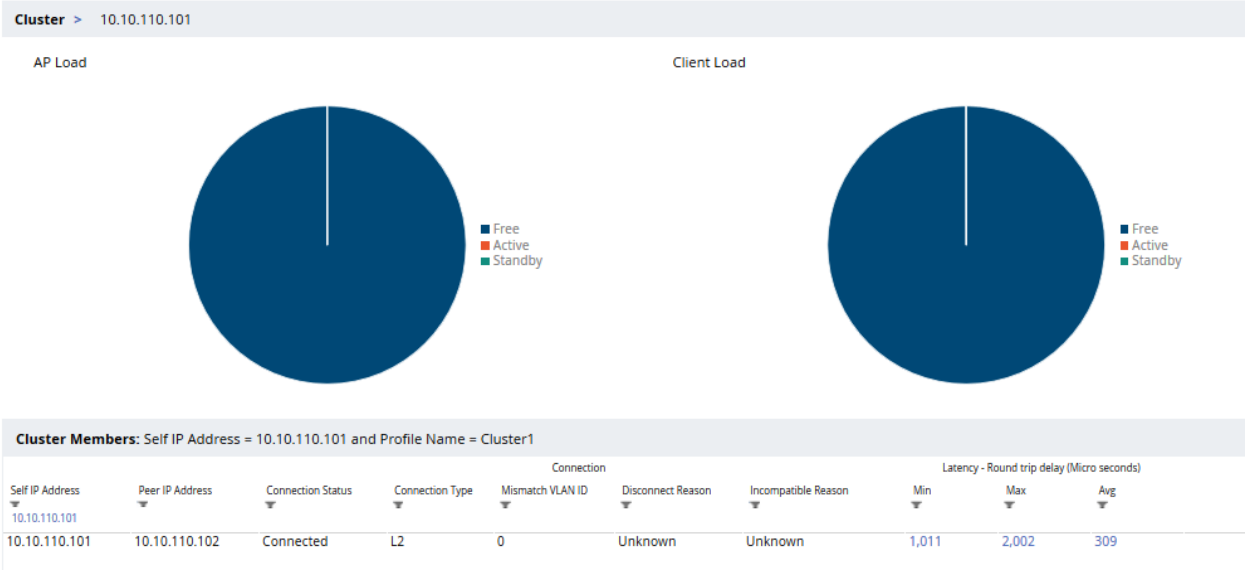
Verify that both controllers have joined the cluster by viewing their status in the Dashboard (give it a few minutes to push the configuration down and member leader to establish).

- Navigate to **Managed Networks→Dashboard→Cluster**



Verify your controllers have formed a Layer-2 cluster. Verify that the Connection type of each controller is L2.

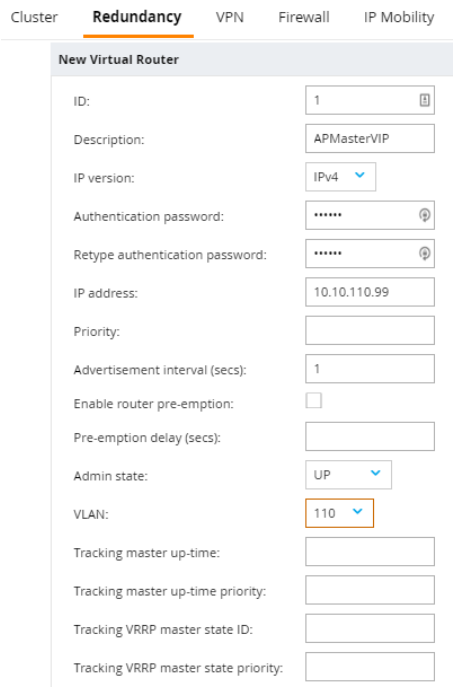
- Navigate to **Managed Networks-->Dashboard→Cluster→Cluster Members**
- Click on **10.10.1X0.101**
- Repeat for Controller **10.10.1X0.102**



Cluster VIP

For the final step in building a cluster we will build an AP Master Virtual IP (VIP). In practice, this would be done in deployments as APs are typically not in the same subnet as the controller cluster. For discovery methods outside of ADP (L2 broadcast), you would want to provide a virtual IP address that gets mapped to your controller cluster's IPs. You will use the AP Master VIP in a later lab as a discovery option when you provision your AP.

- Navigate to: **Managed Network→GroupX→7005-X→ Configuration→Services→Redundancy→Virtual Router Table**
- Click **+**
- ID: **1**
- Description: **APMasterVIP**
- Authentication Password: ***secret***
- Retype Authentication Password: ***secret***
- IP Address: **10.10.1X0.99**
- Admin state: **up**
- VLAN: **1X0**



- **Submit, Pending Changes, Deploy Changes**

Repeat this for your other controller:

- Navigate to: **Managed Network→GroupX→7005-XX→ Configuration→Services→Redundancy→Virtual Router Table**
- Click **+**
- ID: **1**
- Description: **APMasterVIP**
- Authentication Password: ***secret***
- Retype Authentication Password: ***secret***
- IP Address: **10.10.1X0.99**
- Admin state: **up**
- VLAN: **1X0**
- **Submit, Pending Changes, Deploy Changes**

Lab 5 - AP Discovery

Goal:

In this lab, you will create an AP group that will be used for WLAN service creation in subsequent labs. AP's will then be reset and discovered by your controller cluster. After discovery, you will approve/provision discovered AP(s) and assign them to your AP group.

Task Summary

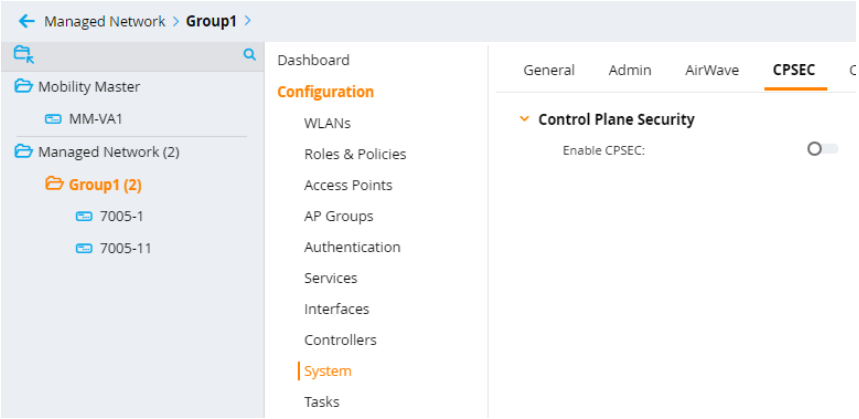
- Create AP group for service creation
- Add AP to your network and verify discovery
- Approve/Provision discovered AP into AP group specifying name, address, discovery mode, deployment model, etc.

Workflow:

Control Plane Security

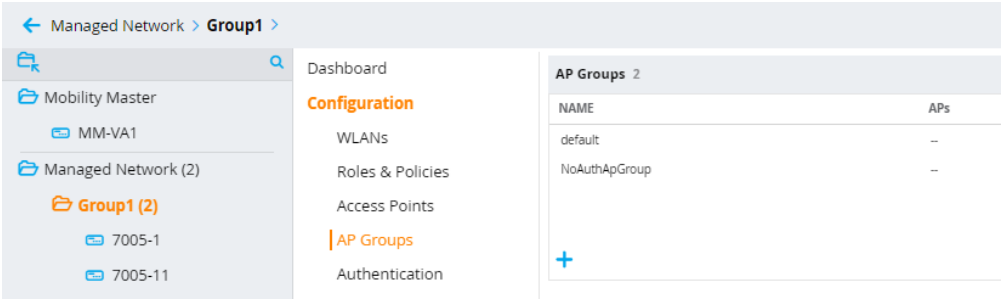
To simplify AP discovery in this lab, we need to verify that control-plane security (CPsec) is disabled for your group (System default is Enabled).

- Navigate to: **Managed Network→GroupX→Configuration→System→CPSEC**
- Control Plane Security→ Enable CPsec: (click off)
- **Submit, Pending Changes, Deploy Changes**

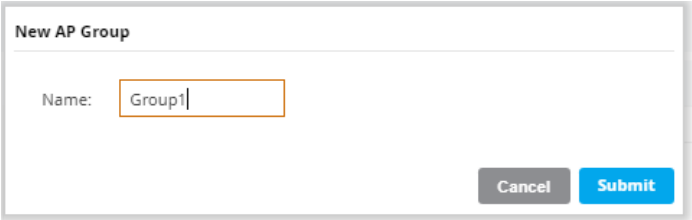


Create an AP group

- Navigate to: **Managed Networks→GroupX→Configuration→AP Groups**
- Click +



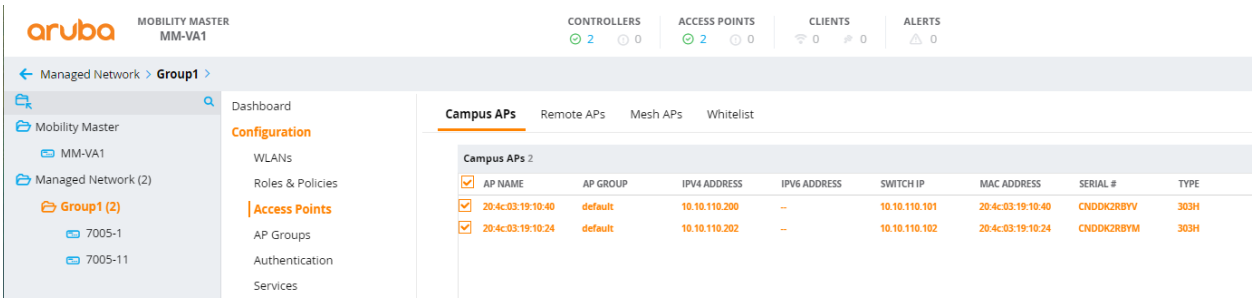
- Name: **GroupX**
- Click: **Submit, Pending Changes, Deploy Changes**



Connect Access Points

In this step, you will connect your two Access Points to the network. The APs will use Aruba Discovery Protocol (ADP) to find the nearest controller. Note: if you have an IAP, convert it to a CAP (See Appendix B) and have it discover your controller cluster. Your AP should reset, reboot, and find one of your controllers. Monitor the MM to see when your APs connect with the controllers.

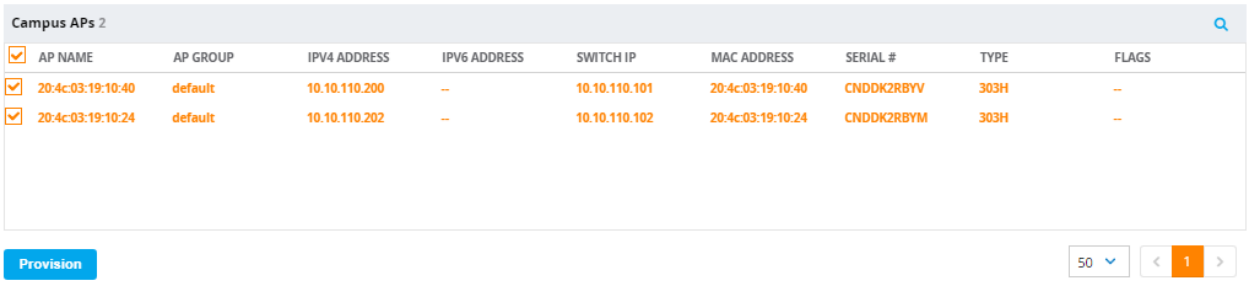
- Plug your AP into one of the switch ports assigned to your group
- Reset your AP by pressing the reset button with a paperclip for 10 seconds
- Navigate to: **Managed Network→GroupX→Configuration→Access Points**



Provision Access Points

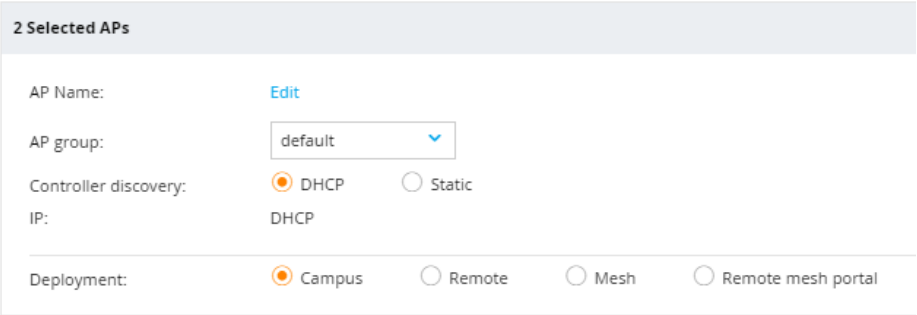
After a few minutes you should see both Access Points in the list of Campus APs. In this step, we will provision the APs to use the Cluster VIP to connect to their controllers. We will also rename each AP to make them easier to recognize and manage.

- Select both APs
- Click **Provision**



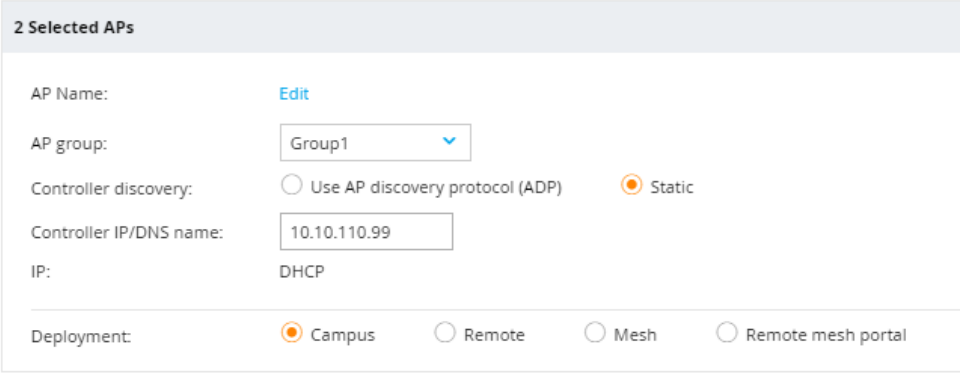
A new window expands where you can assign each AP a unique name, assign them to an AP group and configure the Cluster VIP as the controller's IP address.

- AP Name: **Edit**



- Update AP Names
  - Name: **AP-1**
  - Name: **AP-2**
- Click **OK**

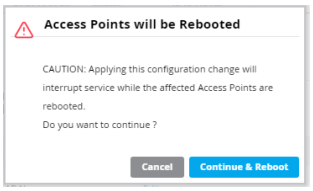
- AP Group: **GroupX**
- Controller discovery: **Static**
- Controller IP/DNS name: **10.10.1X0.99**



- Click: **Submit, Pending Changes, Deploy Changes**

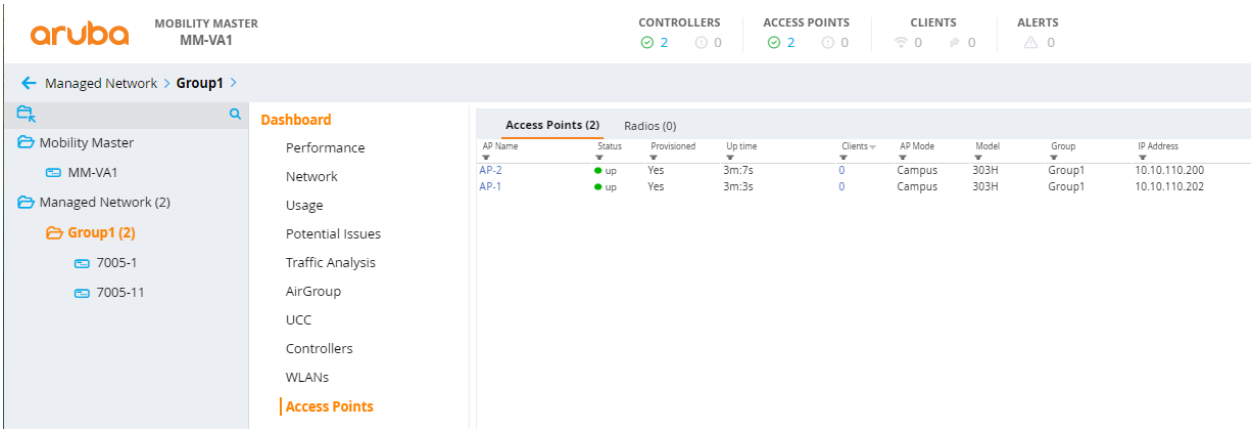
You are warned that your APs will reboot.

- Click **Continue & Reboot**



After a few minutes, check the AP status on the Mobility Master and verify that they are operational (green up status) using the Dashboard. Verify that they reflect their new names and that they are assigned to the GroupX AP Group.

- Navigate to: **Managed Network→GroupX→Dashboard→Access Points**



Lab 6 - WLAN Service Creation: PSK

Goal:

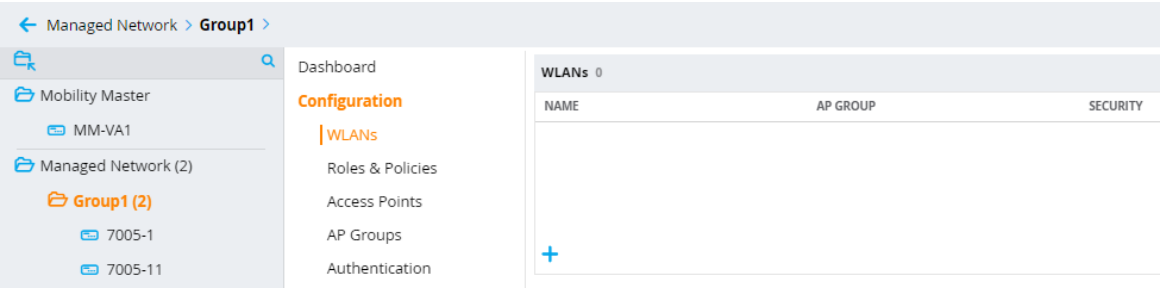
In this lab, we will build a pre-shared key WLAN service to test our environment.

Task Summary:

- Create PSK WLAN services using the wizard.
- Test with your client to verify you underlying configuration is setup properly from previous labs.

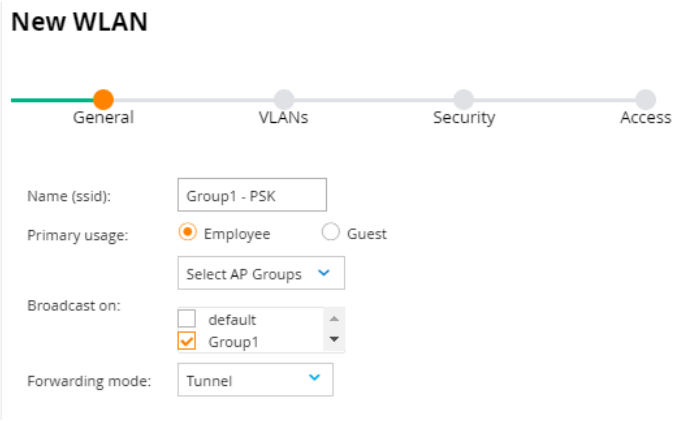
Workflow:

- Login to your Mobility Master: **https://10.10.1.XX**
- Navigate to: **Managed Network→GroupX→Configuration→WLAN**
- Click **+**



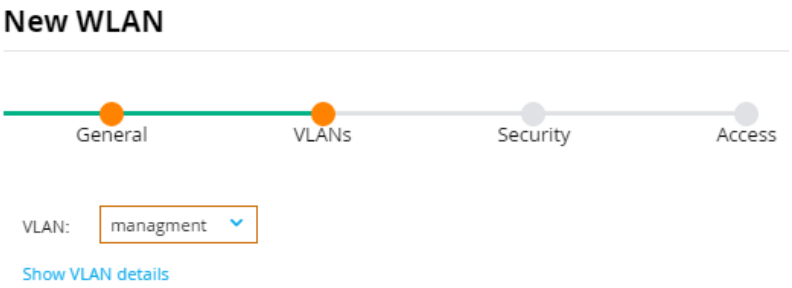
General

- Name (ssid): **PSKX**
- Primary usage: **Employee**
- Select AP Groups → **GroupX**
- Forwarding mode: **Tunnel**
- Click **next**



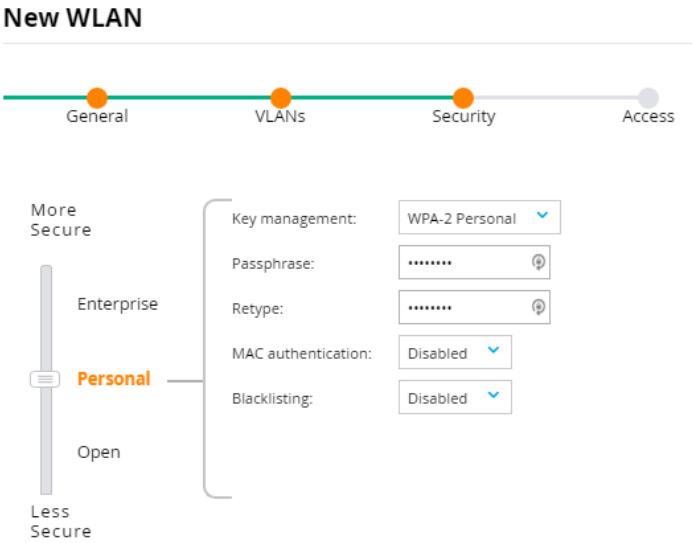
VLANs

- VLAN: **management**
- Click **Next**



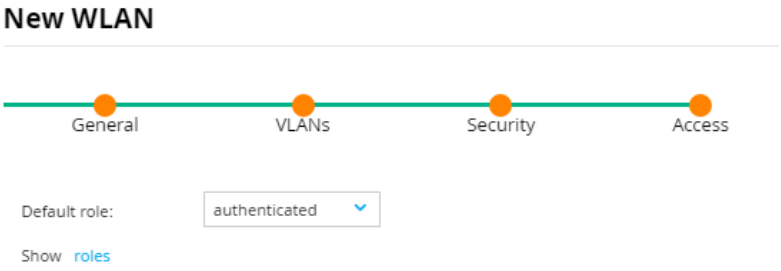
Security

- Security: **Personal**
- Key management: **WPA-2 Personal**
- Passphrase: ***aruba123***
- Retype: ***aruba123***
- Click **Next**

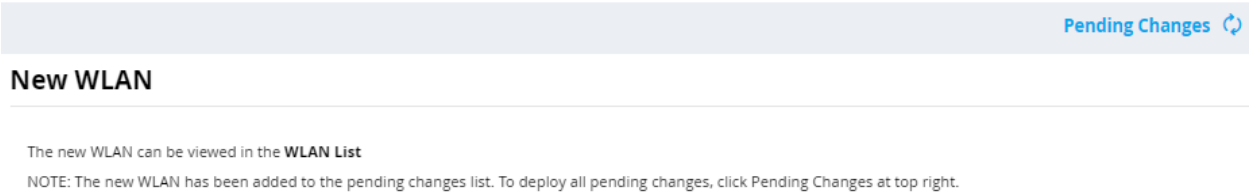


Access

- Default role: **Authenticated**
- Click **Finish**



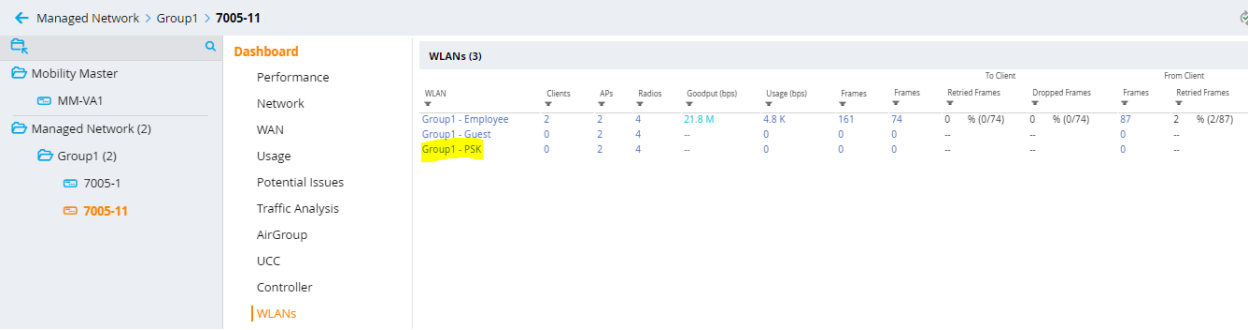
- Click: **Pending Changes, Deploy Changes**



Test Service Verification

Verify that your new WLAN has been created and is operational in the Dashboard.

- Navigate to: **Managed Networks→GroupX→Dashboard→WLAN**



Test the WLAN by connecting with your device:

- SSID: **PSKX**
- Passphrase: **aruba123**

Using the dashboard answer the following:

1. What is the IP address of your device?
2. Which AP were you connected to?
3. What role were you assigned?
4. Were you able to browse the Internet?

CLI

In this task we explore new commands that were introduced in AOS8 to navigate and make configuration changes in a Mobility Master managed node hierarchy. We will explore the CLI using the Mobility Master as well as the Managed Device (MD) context. For MDs, we will leverage the new MDC (managed device connect) feature to easily switch between these context.

Connect to your Mobility Master with an SSH client:

```
ssh 10.10.1.XX
username: admin
password: aruba123
```

In Mobility Master, configurations are stored in a hierarchy of folders. Look at the node-hierarchy on your MM:

```
(MM-VAX) [/] #show configuration node-hierarchy
```

Each folder inherits the configuration from its parent folder. To see the configuration for the folder you are in use the “effective” verb. You can also use piping and filtering so find the relevant configuration line. For example, show the ap-group configuration at the root folder level:

```
(MM-VAX) [/] #show configuration effective | include ap-group
```

Navigation through the node-hierarchy is the same as moving from folder to folder on other platforms. Use the following commands to change to a different folder’s context.

```
(MM-VAX) [/] #cd /md/groupX
(MM-VAX) [/md/groupX] #pwd
```

The configuration may be inherited from the parent, or it may be unique at that level. For example repeat the command to show ap-groups and compare the configuration in this folder to the configuration in the root folder above:

```
(MM-VAX) [/md/groupX] #show configuration effective | include ap-group
```

You can cd directly to your MD. For example: navigate to the 7005-X configuration node context and issue the following commands. Were you able to see any state information on APs or users?

```
(MM-VAX) [/] #cd 7005-X
(MM-VAX) [xx:xx:xx:xx:xx:xx]show ap active
(MM-VAX) [xx:xx:xx:xx:xx:xx]show user
```

The Mobility Master provides a method to SSH directly into a Managed Device from the MM CLI. A special user named “seamless-logon-w” is created in the MM. This user’s configuration is inherited by each controller. The mdc command starts an SSH session from the MM to the MD using this special account. Use mdc to access your 7005-XX controller:

```
(MM-VAX) [xx:xx:xx:xx:xx:xx]mdc
```

In the controller’s context issue the same commands.
Are you able to see any state information (APs or users)?
Are you able to enter configuration mode and make any changes?

```
(7005-X) [MDC] *#show ap active
(7005-X) [MDC] *#show user
(7005-X) [MDC] *#configure terminal
(7005-X) [MDC] *#exit
```

Change your context to 7005-XX. MDC into the controller and repeat the commands. Compare your results to those from 7005-X. Some users and APs may have active sessions on one controller and not the other.

```
(MM-VAX) [/] #cd 7005-XX
(MM-VAX) [xx:xx:xx:xx:xx:xx]mdc
```

Are you able to enter configuration mode and make any changes?
Which controller is your (wlan) user attached to?
Which controller(s) are your APs attached to?

```
(7005-XX) [MDC] *#show ap active
(7005-XX) [MDC] *#show user
(7005-XX) [MDC] *#configure terminal
(7005-XX) [MDC] *#exit
```

Exercise:
The location command annotates the controller with its physical (geo) location. Modify the location using the CLI. At the group level set the location to “California”. Verify that the controllers inherit the “California” location. At the managed device level, make the location unique for each controller. Using MDC, verify the location is unique on each controller.

Configure the location for your group (/md/GroupX) = California
Configure the location for 7005-X (/md/GroupX/7005-X) = Sunnyvale, CA
Configure the location for 7005-XX (/md/GroupX/7005-XX) = Palo Alto, CA

Hint: *you will need to use the cd, configure terminal, location, write memory & mdc commands.*

```
(MM-VAX) [/] #cd 7005-X
(7005-X) [MDC] *#show location
```

Lab 7 - WLAN Service Creation: Guest (Internal Captive Portal)

Goal:

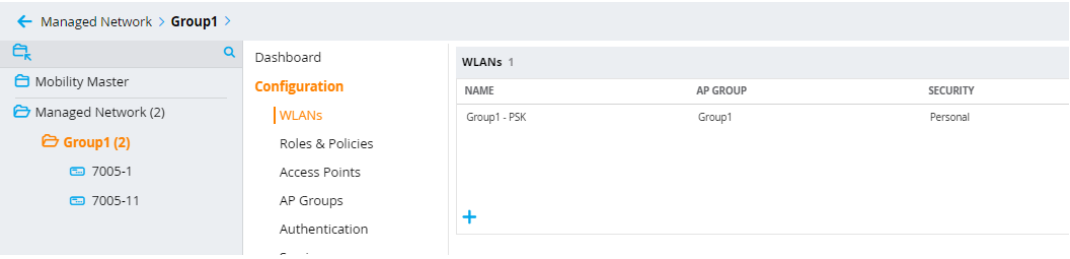
Build a Guest WLAN service using the controller's internal captive portal. Examine the default profile created as a result. For Captive Portal service the Guest VLAN must have an IP interface configured on each controller. In Lab 3, we created the Guest VLAN, configured IP interfaces, enabled NAT and configured a DHCP server on each controller.

Task Summary:

- Create a Guest (Internal Captive Portal) WLAN services using the wizard
- Configure Captive Portal access via Firewall Rule (or Layer 3 IP address)
- View default role that was created (Policies and rules)
- Test with your device

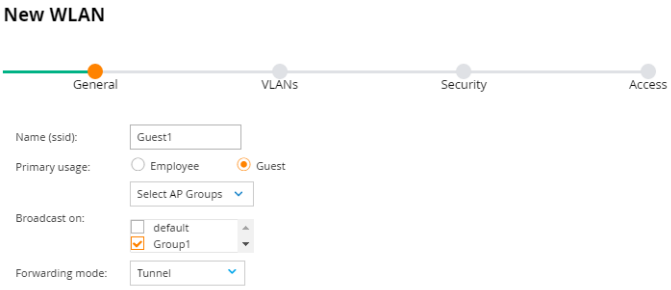
Workflow:

- Login to your Mobility Master: **https://10.10.1.XX**
- Navigate to: **Managed Network→GroupX→Configuration→WLANs**
- Click **+**



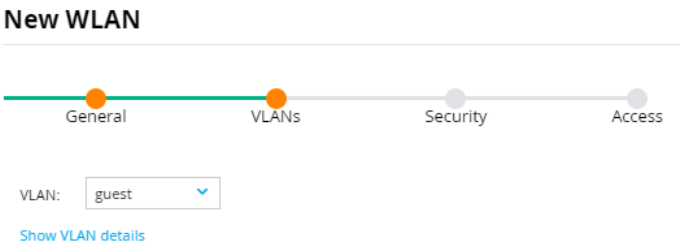
General

- Name (ssid): **GuestX**
- Primary usage: **Guest**
- Select AP Groups → **GroupX**
- Forwarding mode: **Tunnel**
- Click **Next**



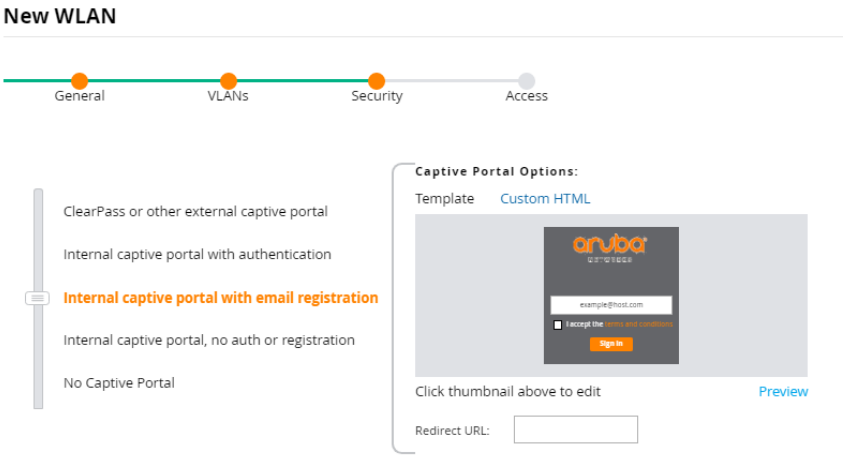
VLANs

- VLAN: **guest**
- Click **Next**



Security

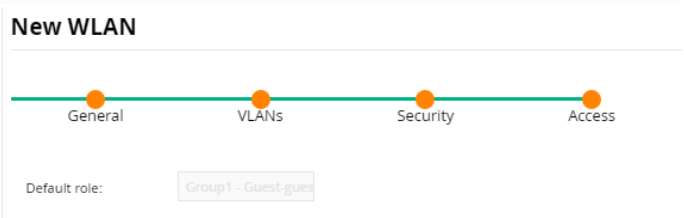
- **Internal captive portal with email registration**
- Click **Next**



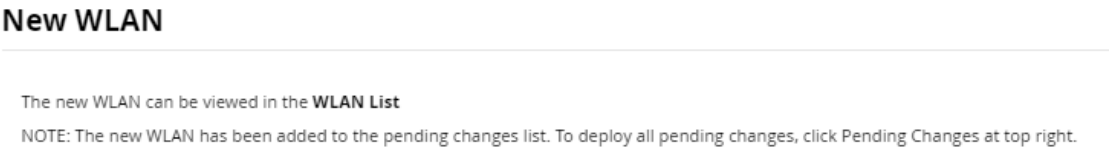
Access

Note that the wizard creates a default role for guest users named GroupX – Guest-guest

- Click **Finish**



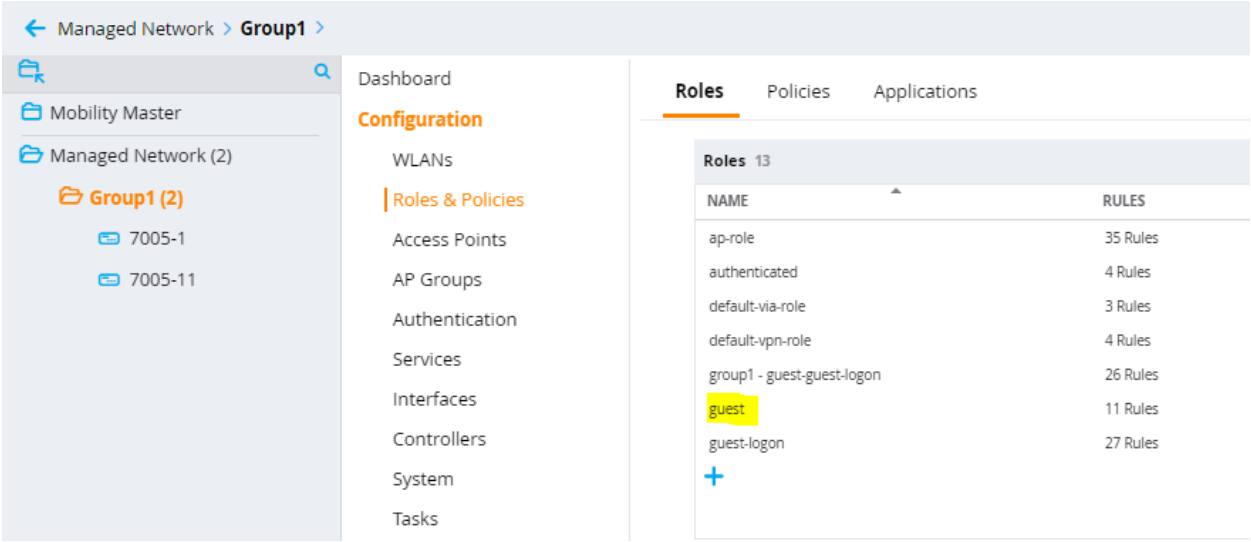
- Click: **Pending Changes, Deploy Changes**



Restricting Guests

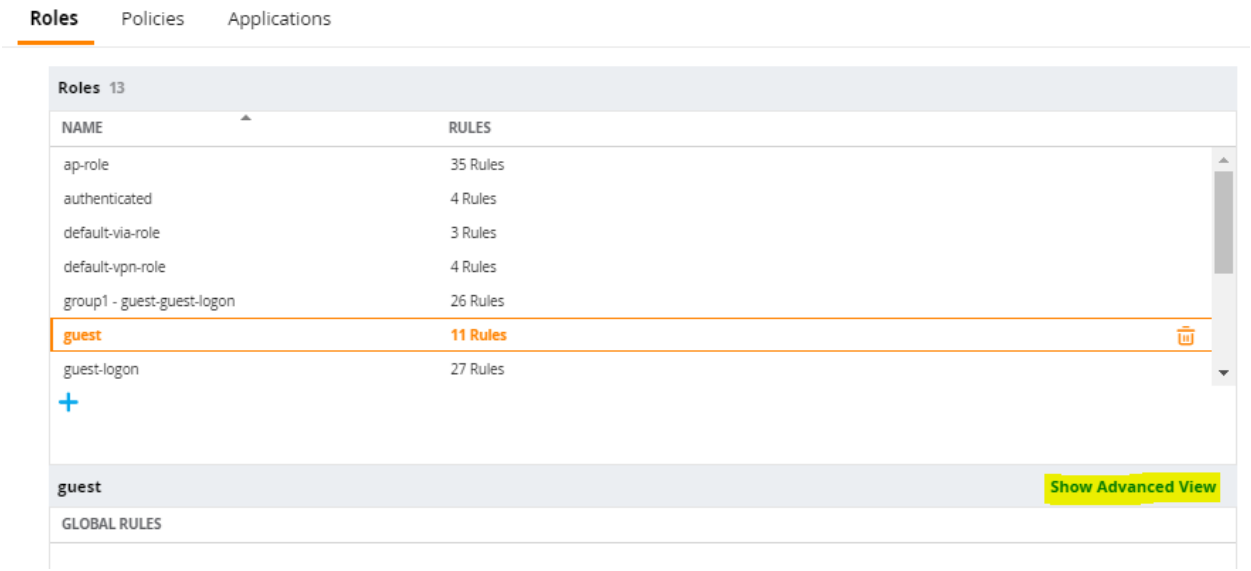
Guests are assigned to the guest role. Roles map to security policies which contain firewall rules that restrict access to the network. In this case, we allow guest users to access the Internet. However, they are prevented from accessing the corporate network by this security policy.

- Navigate to **Managed Network→ GroupX→Configuration→Roles & Policies→Roles**
- Click on **guest**



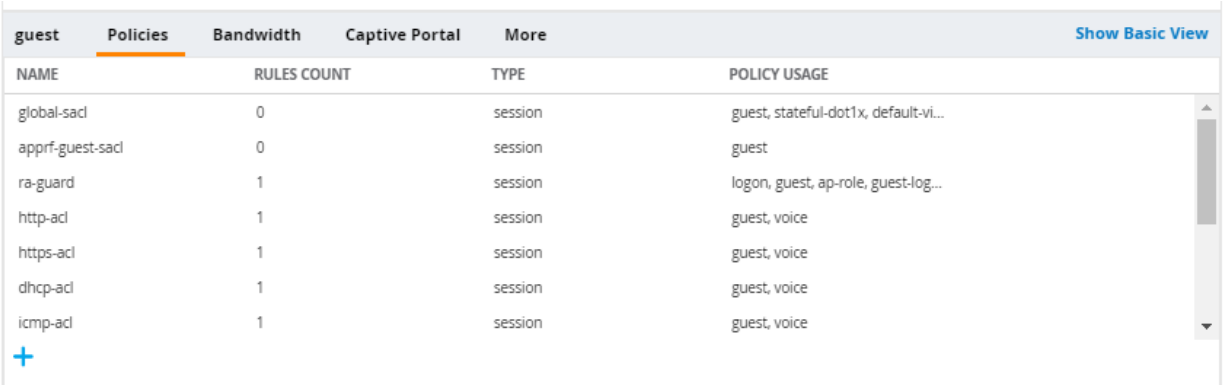
A lower panel opens that allows you to configure policies in the role.

- Click **Show Advanced View**

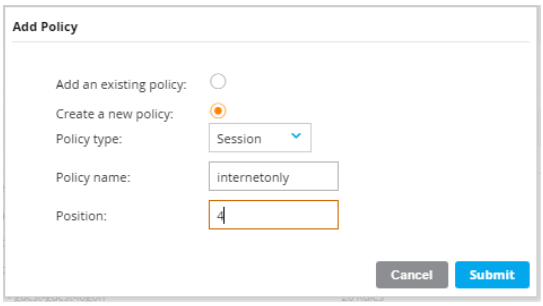


The advanced view displays all the policies in this role. Add a new policy to prevent guests from accessing the corporate network.

- Click +



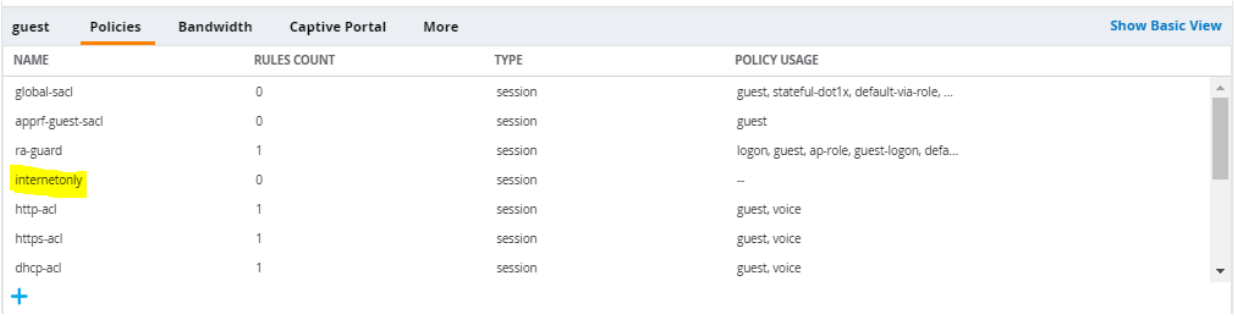
- **Create a new Policy**
- Policy type: **Session**
- Policy Name: **internetonly**
- Position: **4**
- Click **Submit**



- Click: **Pending Changes, Deploy Changes**

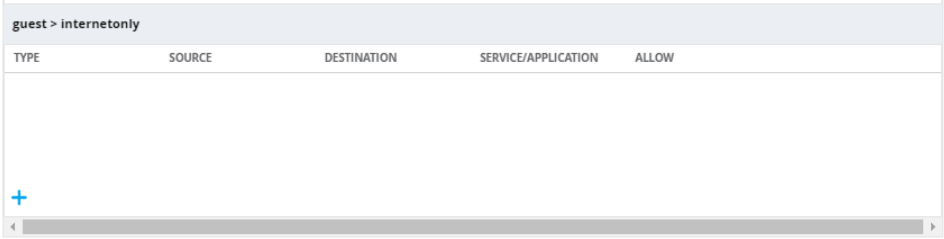
You are returned to the Guest Role Policies panel. Create the rules for this policy.

- Click **internetonly**

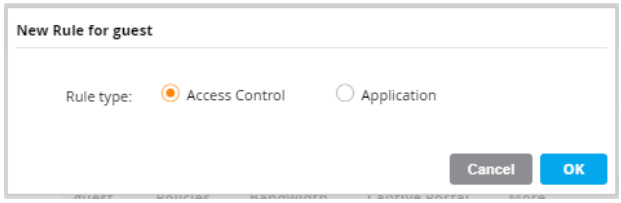


The internet only policy panel opens. Add a firewall rule to prevent guest traffic from accessing the corporate network.

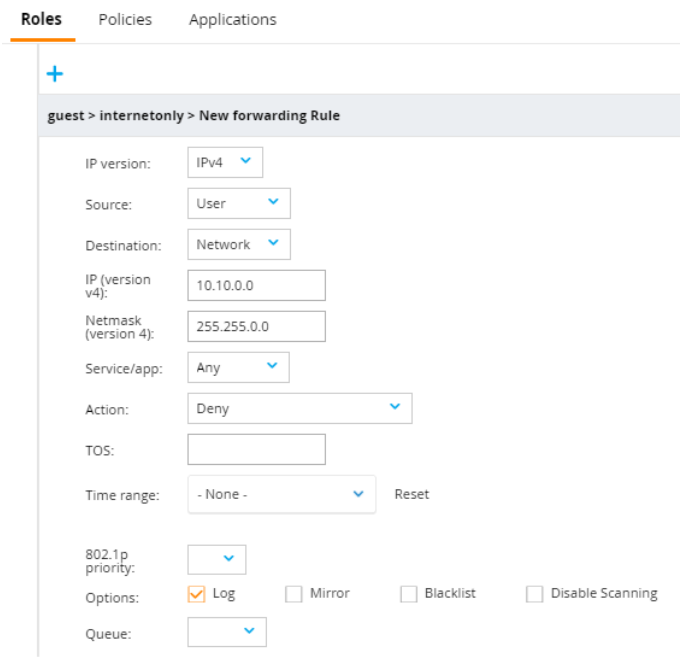
- Click +



- Rule type: **Access Control**
- Click **OK**



- guest>internetonly>New forwarding Rule
  - IP version: **IPv4**
  - Source: **User**
  - Destination: **Network**
  - IP: **10.10.0.0**
  - Netmask: **255.255.0.0**
  - Service/app: **Any**
  - Action: **Deny**
  - Options: **Log**

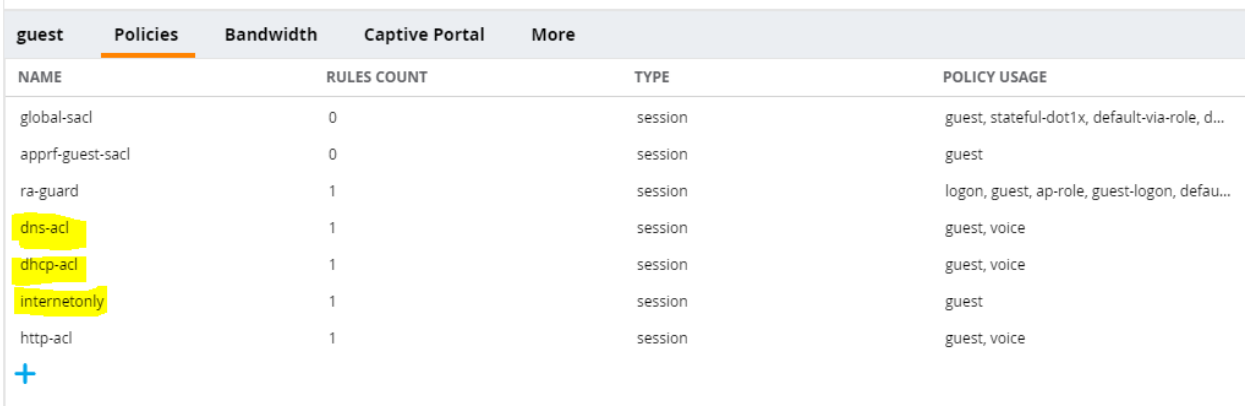


- Click: **Submit, Pending Changes, Deploy Changes**

Re-Order rules

As with any firewall, the order of rules is significant. Insure that the internetonly, dhcp-acl & dns-acl are in positions 4,5 & 6 respectively. If they are not, drag-and-drop the policy to its proper place in the list.

- Click: **Pending Changes, Deploy Changes**

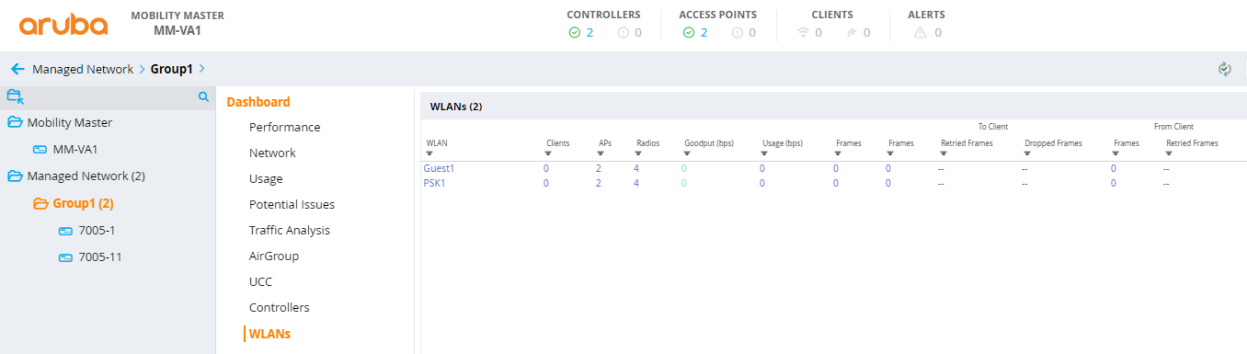


NAME	RULES COUNT	TYPE	POLICY USAGE
global-sacl	0	session	guest, stateful-dot1x, default-via-role, d...
apprf-guest-sacl	0	session	guest
ra-guard	1	session	logon, guest, ap-role, guest-logon, defau...
dns-acl	1	session	guest, voice
dhcp-acl	1	session	guest, voice
internetonly	1	session	guest
http-acl	1	session	guest, voice

Guest Service Verification

Guest users should be able to browse the internet. However, they should not be able to access the Corporate network (10.10.0.0) Verify that your new WLAN has been created and is operational in the Dashboard.

- Navigate to: **Managed Networks→GroupX→Dashboard→WLAN**



Test the WLAN by connecting with your device:

- SSID: **GuestX**
- Username: ***yourmail***

Using the dashboard answer the following:

1. What is the IP address was assigned to your device?
2. Based on your IP address, what VLAN were you assigned (3rd octet)?
3. Which AP were you connected to?
4. What role were you assigned?
5. Were you able to browse the Internet?
6. Were you able access the Corporate network (for example try https://10.10.1.10)?

Lab 8 - WLAN Service Creation: Employee Dot1X

Goal:

The goal of this lab is to build an Employee WLAN service that is authenticated via 802.1x from the workshkop Windows Radius/AD Server. Login will use existing credentials configured on the workshop AD Server.

Task Summary:

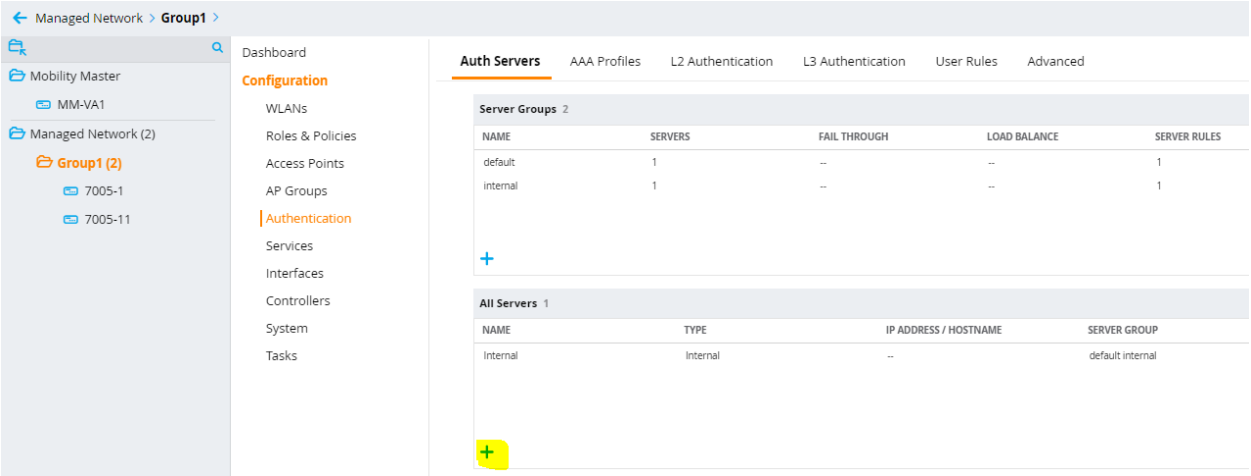
- Create a RADIUS Server entry for the workshop's Windows AD Server.
- Invoke the WLAN wizard to create a new Employee Service.
- Connect and verify you can authenticate and connect to the newly created service

Workflow

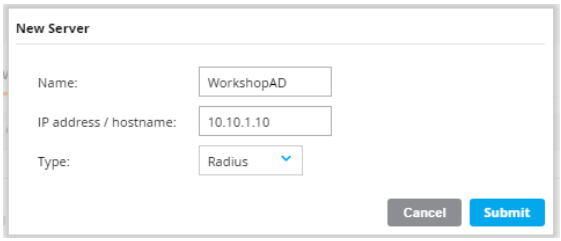
Controller RADIUS Configuration

Begin by configuring the workshop's Active Directory server to be used as the RADIUS server for 802.1X authentication. Configure a RADIUS at the GroupX level. Both controllers will inherit this configuration.

- Log into your Mobility Master: **https://10.10.1.XX**
- Navigate to: **Mobility Master→Managed Networks->GroupX→ Configuration→Authentication→Auth Servers→All Servers**
- Click **+**



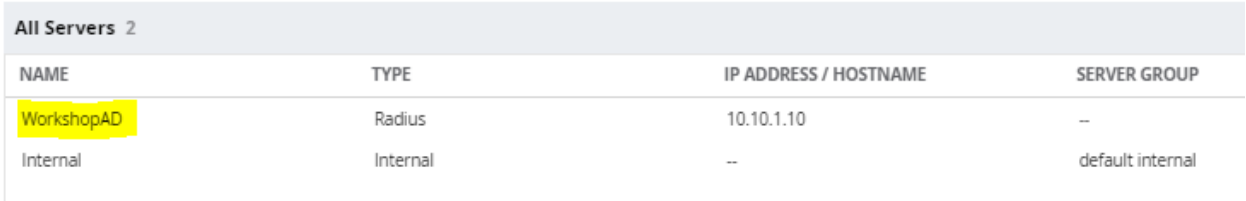
- Name: **WorkshopAD**
- IP Address: **10.10.1.10**
- Type: **Radius**



- Click: **Submit Pending Changes, Deploy Changes**

When you are returned to the All Servers panel, note that WorkshopAD is in the list of servers. Configure the RADIUS shared secret.

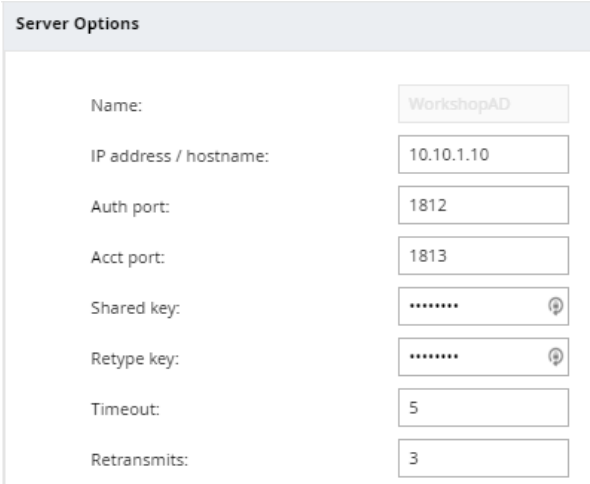
- Click on **WorkshopAD**



All Servers 2

NAME	TYPE	IP ADDRESS / HOSTNAME	SERVER GROUP
WorkshopAD	Radius	10.10.1.10	--
Internal	Internal	--	default internal

- Server Options
  - Shared key: ***secret***
  - Retype key: ***secret***



Server Options

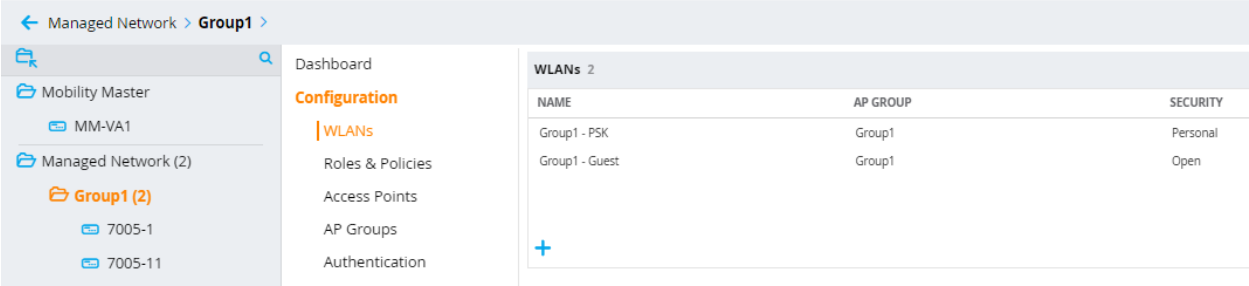
Name:	WorkshopAD
IP address / hostname:	10.10.1.10
Auth port:	1812
Acct port:	1813
Shared key:	••••••••
Retype key:	••••••••
Timeout:	5
Retransmits:	3

- Click **Submit, Pending Changes, Deploy Changes**

802.1X Service Creation

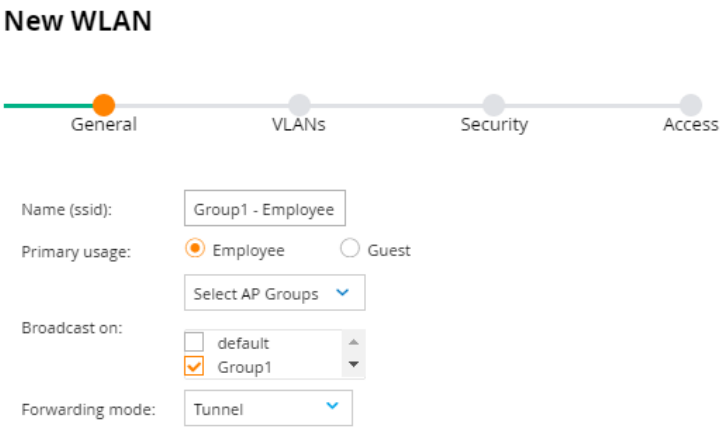
Now that we've added our RADIUS Server, let's build our first 802.1x Employee Service.

- Navigate to: Managed Network→GroupX→Configuration→WLAN
- Click +



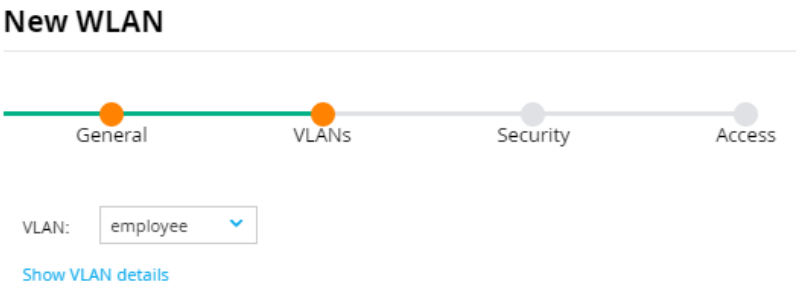
General

- Name: **EmployeeX**
- Primary Usage: **Employee**
- Select AP Groups: **GroupX**
- Forwarding Mode: **Tunnel**
- Click **Next**



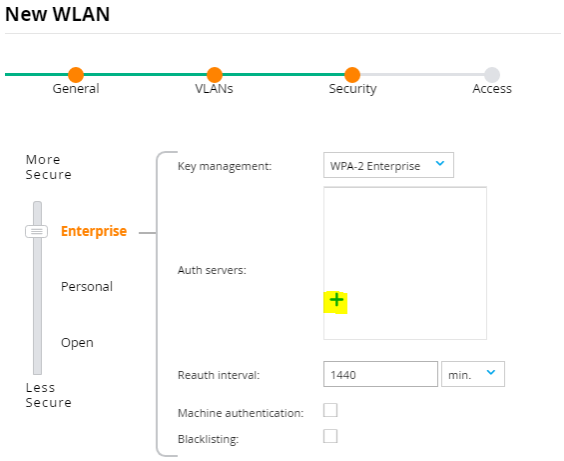
VLANs

- VLAN: **employee**
- Click **Next**

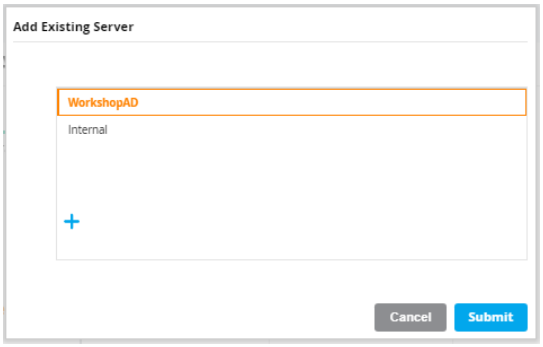


Security

- Security: **Enterprise**
- Key management: **WPA-2 Enterprise**
- Auth servers: **+**

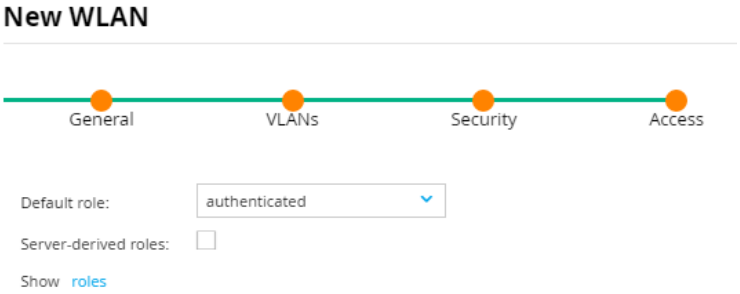


- Add Existing Server: **WorkshopAD**
- Click **Submit**
- Click **Next**

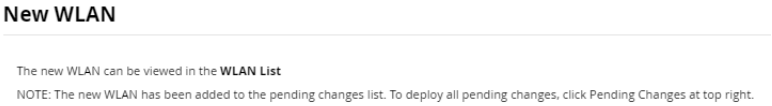


Access

- Default role: **authenticated**
- Click: **Finish**



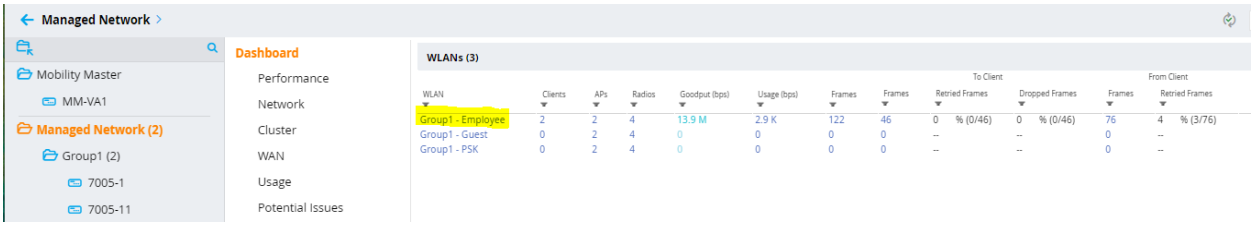
- Click **Pending Changes, Deploy Changes**



Employee Service Verification

Users that successfully authenticate with the Workshop's AD server are assigned to the Employee VLAN (1X2) and should be given full access to the network. Users that fail authentication are prevented from accessing the network. Verify that your new WLAN has been created and is operational in the Dashboard.

- Navigate to: **Managed Networks→GroupX→Dashboard→WLAN**



Test the WLAN by connecting with your device:

- SSID: **EmployeeX**
- Username: **StudentX**
- Password: **Bill+Dave**

Using the dashboard answer the following:

1. What is the IP address was assigned to your device?
2. Based on your IP address, what VLAN were you assigned (3rd octet)?
3. Which AP were you connected to?
4. What role were you assigned?
5. Were you able to browse the Internet?
6. Were you able access the Corporate network (for example try https://10.10.1.10)?

Lab 9 - WLAN Service Creation: Employee Dot1x (Server-Derived Role)

Goal:

The goal of this lab is to expand the Employee service to apply additional restrictions for users in the Finance department. The user's role is determined at login based on the user's department which is returned by the AD server. You will create a finance role and a policy that restricts traffic to the internal network. You will also assign finance department users to a special VLAN.

Task Summary:

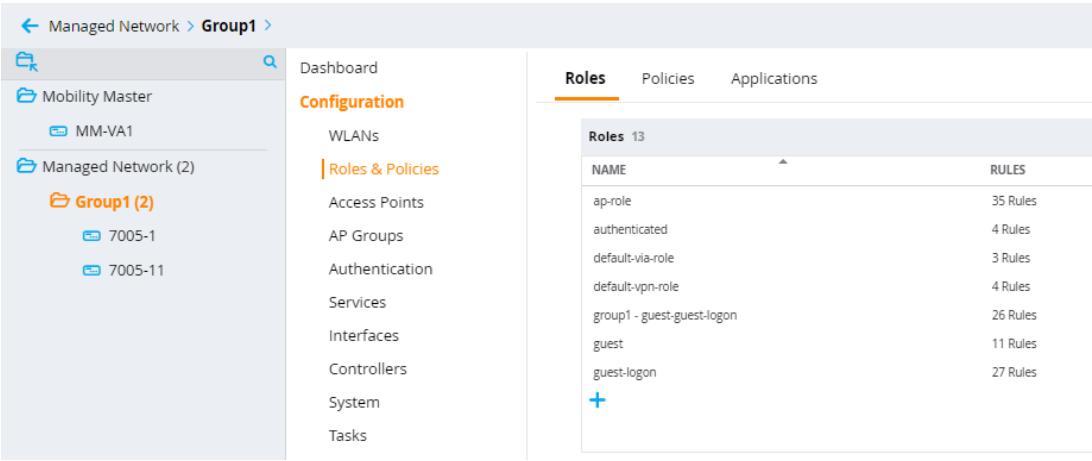
- Create a role called "finance"
- Create a policies for the finance role that permits traffic only to 10.10.0.0
- Modify the Employee WLAN to use a server-derived role
- Test with your client – using login credentials of a user that is in the Finance Department.

Workflow:

Role Creation

Before we define the new WLAN Service, we need to define a new role called "finance".

- Login to your Mobility Master: **https://10.10.1.XX**
- Navigate to: **Managed Network→GroupX→Configuration→Roles and Policies→Roles**
  - Click **+**



The role name is **case sensitive** and must match exactly what is being returned by the RADIUS server.

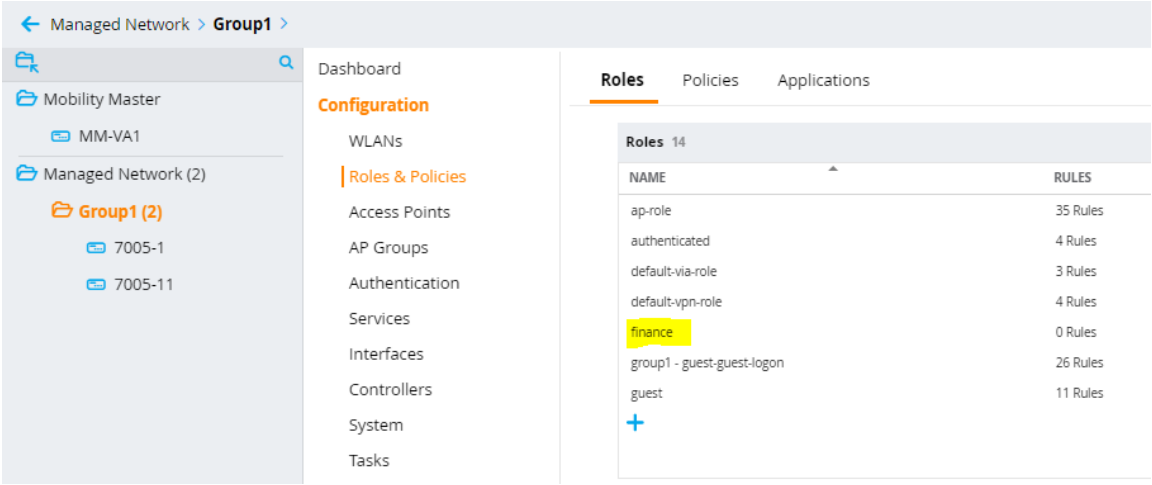
- New Role
  - Name: **finance**

- Click **Submit→Pending Changes→Deploy changes**

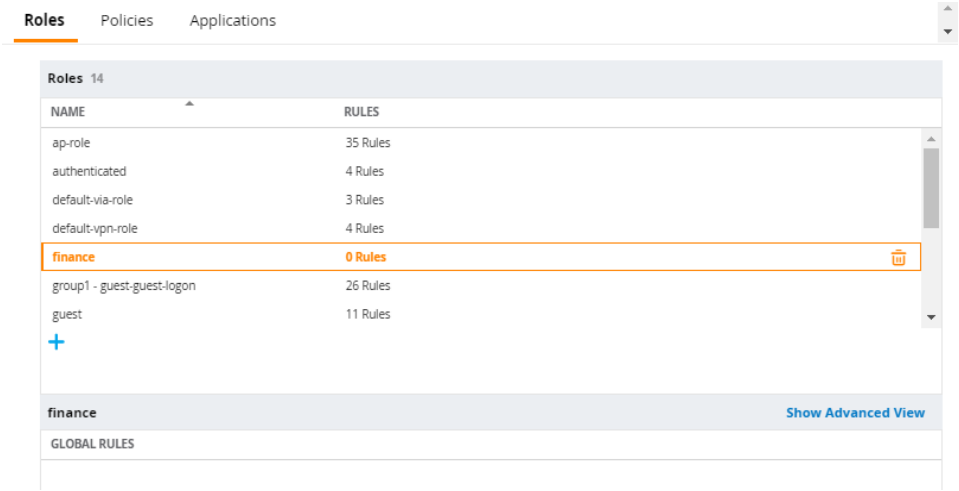
Finance Role VLAN

Modify the finance role to use the finance department's VLAN (1X3).

- Navigate to: **Managed Network→GroupX→Configuration→Roles and Policies→Roles**
- Click on **finance**

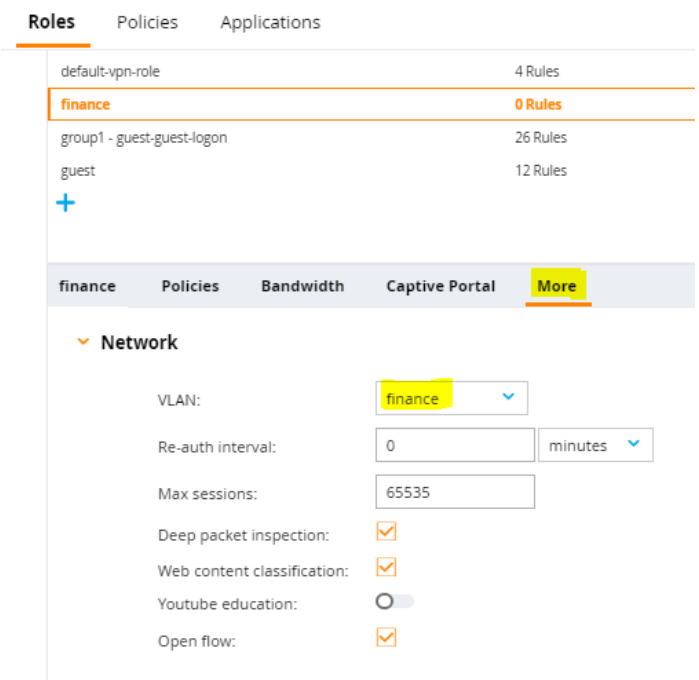


- Click **Show Advanced View**



A panel opens that allows you to configure the finance role details. Here we will specify that finance users will be placed in a special finance VLAN (1X3).

- Click **More**
- Network
    - VLAN: **finance**

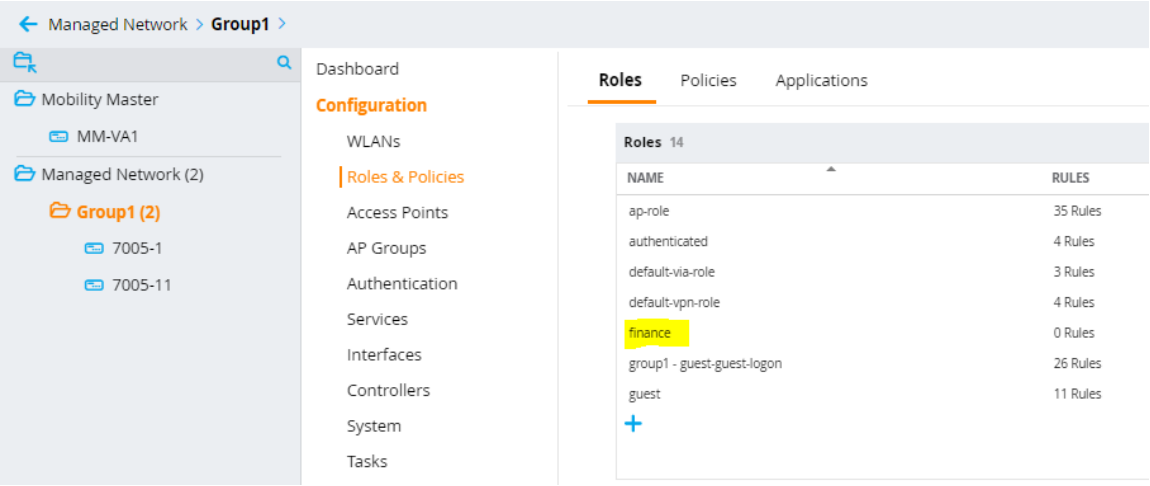


- Click **Submit→Pending Changes→Deploy changes**

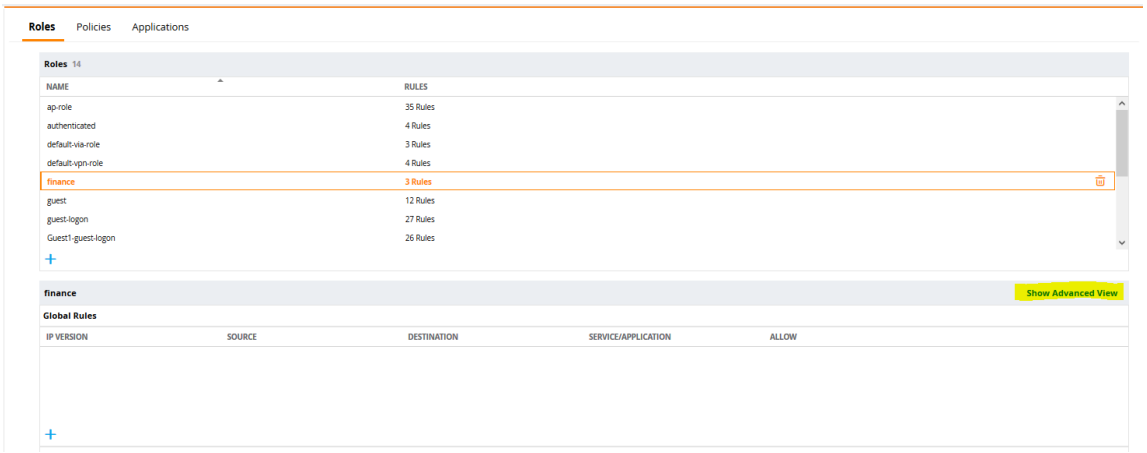
Policy Creation

Add policies to the finance role you just created. Add pre-defined policies to allow DHCP and DNS services (dhcp-alc, dns-acl). Add a new policy to restrict traffic to the internal 10.10.0.0 network & prevent access to the internet.

- Navigate to: **Managed Network→GroupX→Configuration→Roles and Polices→Roles**
- Click on **finance**

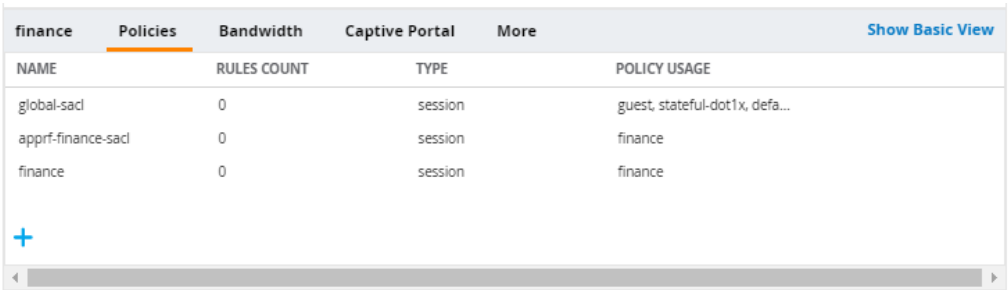


- Click **Show Advanced View**

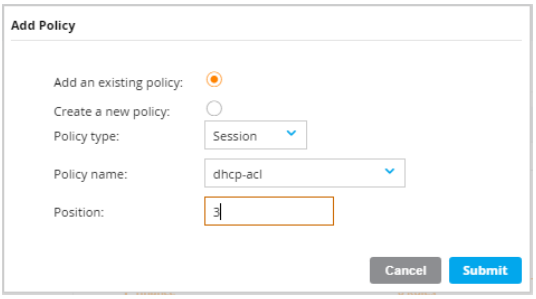


Add a predefined policy to allow DHCP

- Click **+**

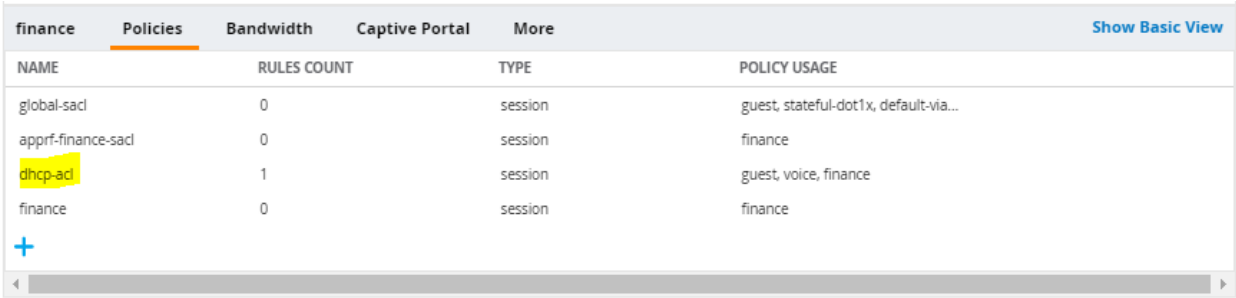


- **Add an existing policy**
- Policy type: **Session**
- Policy name: **dhcp-acl**
- Position: **3**
- Click **Submit**

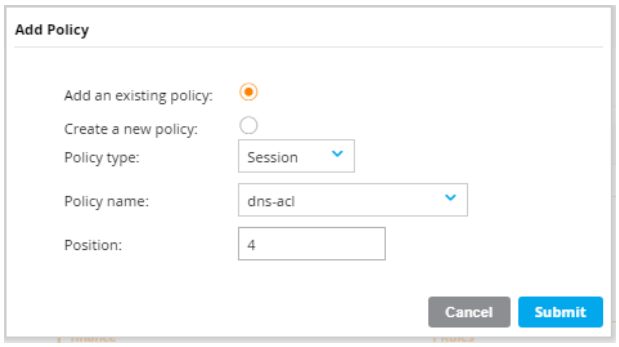


When you are returned to the finance role panel, observe that your dhcp-acl policy has been added in position 3. Repeat the process and add a predefined rule to allow DNS.

- Click +

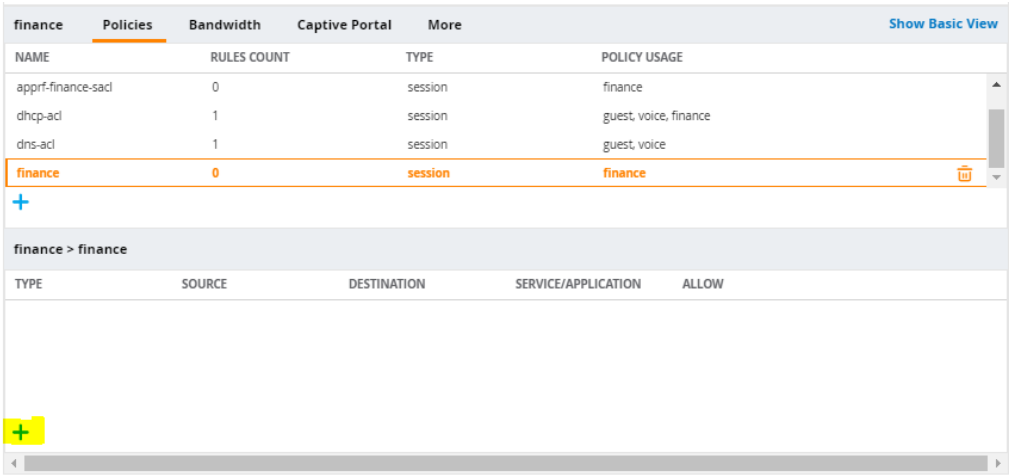


- **Add an existing policy**
- Policy type: **Session**
- Policy name: **dns-acl**
- Position: **4**
- Click **Submit**

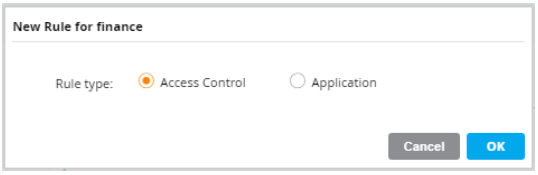


Policies have an implicit “deny all” rule at the end. Therefore, in order to allow access to the internal 10.10.0.0 network, you must create an allow rule. The finance policy is automatically created when the role was created. When you select the finance policy, a new window allows you to create rules for the policy.

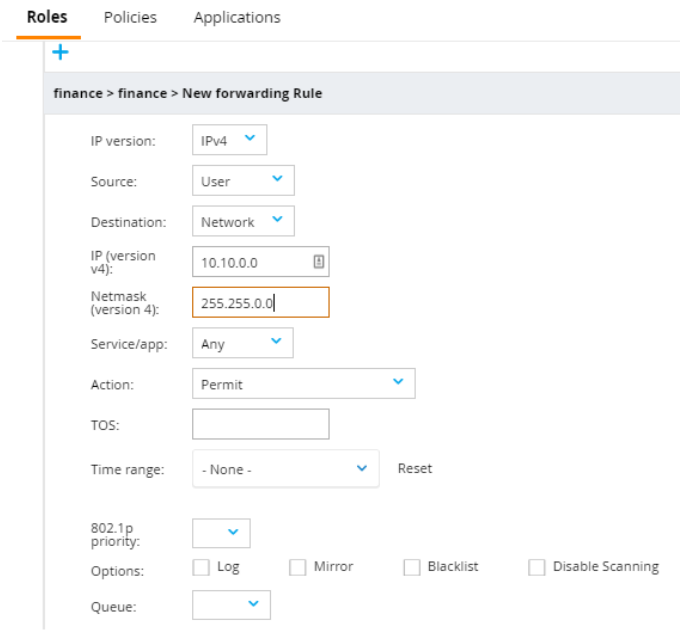
- Click **finance**
- In the finance>finance window click +



- Rule type: **Access Control**
- Click **OK**



- IP version: **IPv4**
- Source: **User**
- Destination: **Network**
- IP: **10.10.0.0**
- Netmask: **255.255.0.0**
- Service/app: **Any**
- Action **Permit**

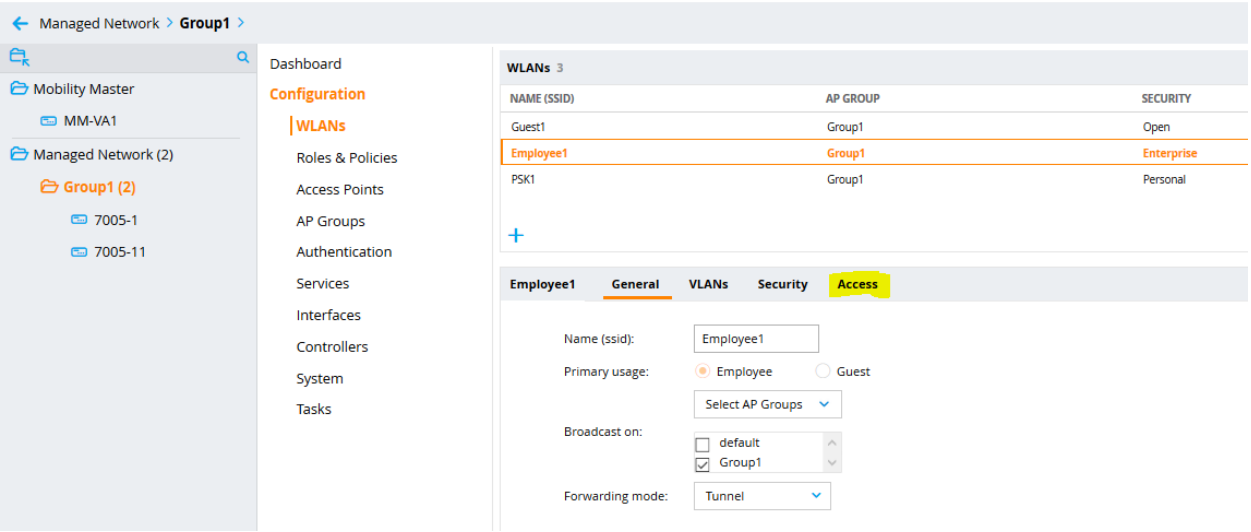


- Click **Submit→Pending Changes→Deploy changes**

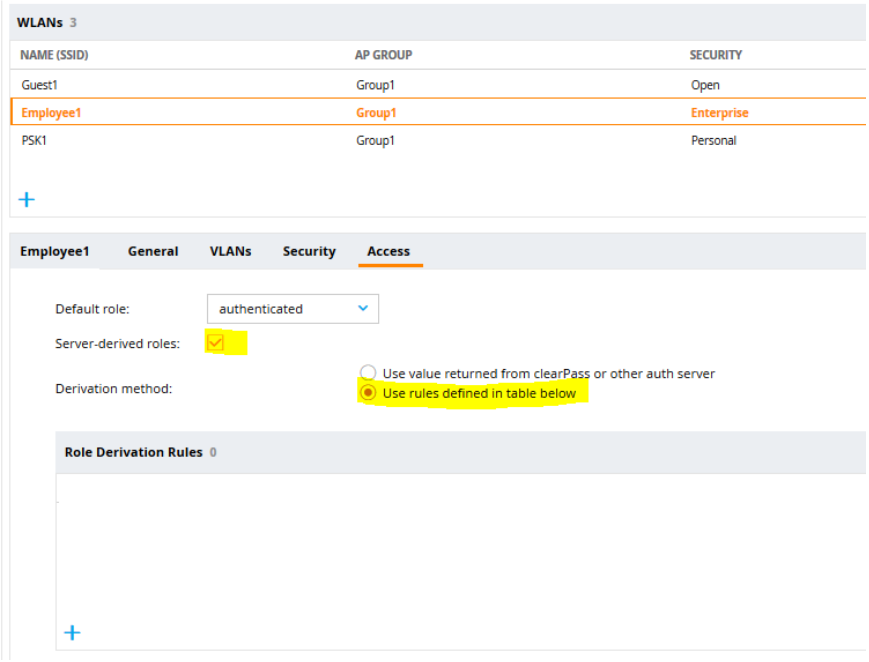
Sever Derived Role

In this lab the user's role is determined by which department they are in. Their role is defined by the "filter-id" RADIUS attribute returned by the AD server during login. On the AD server, NPS is configured to return the user's department (member-of) in the RADIUS filter-id attribute. Modify the EmployeeX service to use Role Based access.

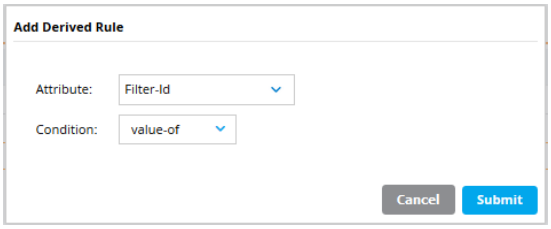
- Navigate to: **Managed Network→GroupX→Configuration→WLANs**
- Click on **EmployeeX**
- Click on **Access**



- Server-derived roles: √
- Derivation method: **Use rules defined in table below**
- In the Role Derivation Rules window click +



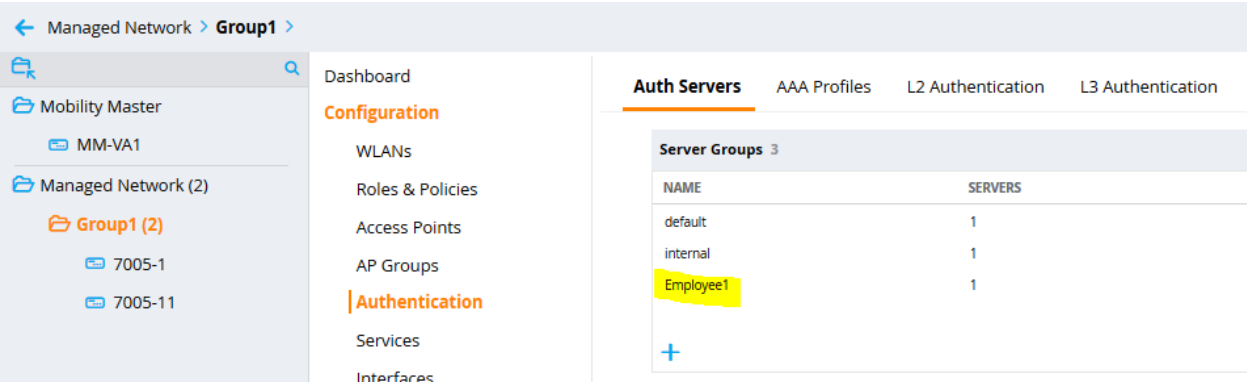
Add Derived Rule



- Attribute: **Filter-Id**
- Condition: **value-of**
- Click **Submit→Pending Changes→Deploy changes**

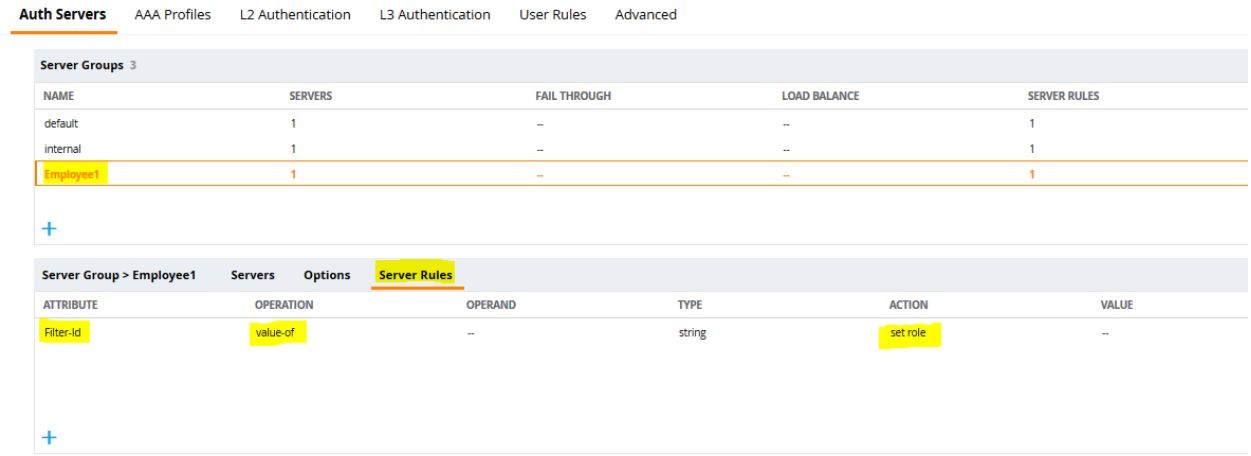
Behind the scenes, the wizard creates a server group named after your SSID. It also creates a server rule which specifies that the "filter-id" attribute that is returned by the RADIUS server is used to derive the user's role. To see this configuration:

- Navigate to: **Managed Network→GroupX→Configuration→Authentication→Auth Servers**
- Click on **EmployeeX**



Note the server rule which uses the filter-id to set the user's role. No further configuration is required.

- Click on **Server Rules**



Role Based Access Server Verification

Test the WLAN by connecting with your device using the credentials for a finance user. In this case, the user John Dough is a member of the finance department. Finance department users will be assigned to the Finance VLAN (1X3). In addition, Finance users will NOT be allowed to access the Internet. Note that you may need to “forget” the EmpoyeeX network to authenticate as a different user.

- SSID: EmployeeX
- Username: JohnDough
- Password: Bill+Dave

Attempt to browse to the internet.

- Were you able to browse the Internet?

Attempt to browse to an internal server (http://10.10.1.10).

- Were you able to browse to the lab network?

Using the dashboard answer the following:

1. What is the IP address of your device?
2. Based on your IP address, what VLAN were you assigned (3rd octet)?
3. Which AP were you connected to?
4. What role were you assigned?

Lab 10 – Cluster Stateful Failover Test

Goal:

In this lab, we will demonstrate the resiliency of controller clustering. This stateful failover tests your controller cluster and its standby anchor connections to the AP and User sessions. You will observe the primary and secondary connect state before, during and after the failure to better understand how service is maintained.

Task Summary:

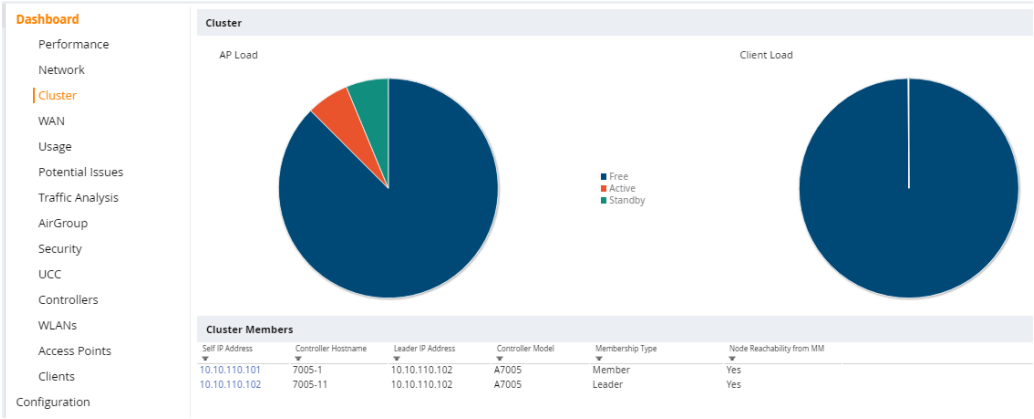
- Establish a wireless session
- Observe the current connection state of User and AP anchor and stand-by connection (these are your primary and standby anchor connections.
- Simulate a failure by powering off one of the controllers while streaming a video or audio service.
- Verify no interruption in service has occurred and primary anchor connections move to the remaining controller
- Bring back the failed controller online and observe cluster status transition back to a 2-node cluster and standby anchor connections are established with the second active controller for both AP and user sessions.

Workflow:

Cluster Status

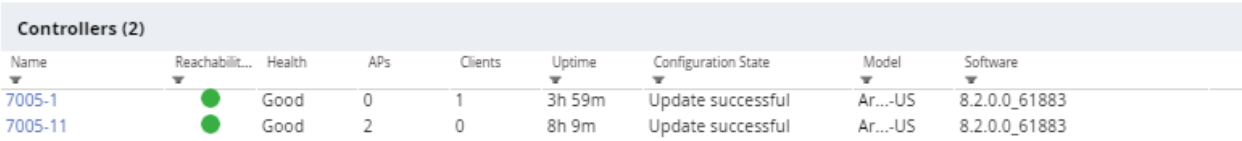
Check the current status of your Cluster. Verify both controllers are in the cluster.

- Navigate to: **Managed Network→Dashboard→Cluster**



Check the status of your controller's connections. Insure that both controllers are in "Good" Health.

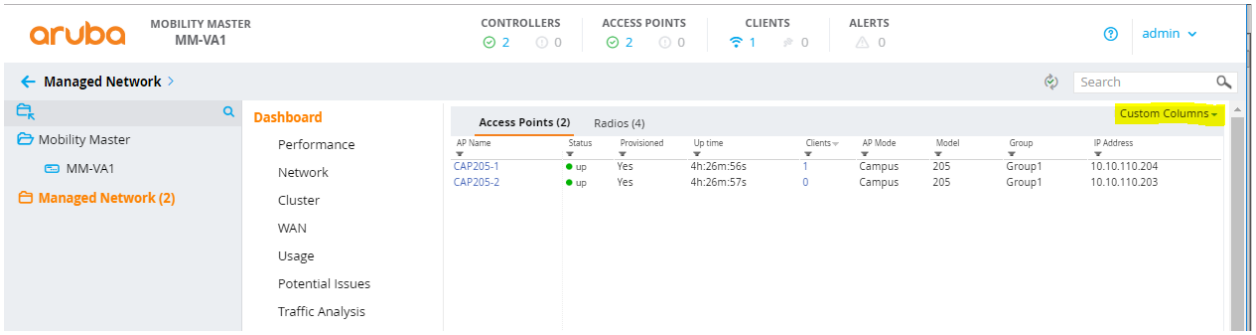
- Navigate to: **Managed Network→Dashboard→Controllers**



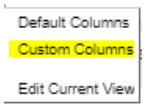
AP Anchor Controllers

Customize your Dashboard to display the current status of your AP's Active and Standby Controllers. When complete, your custom view should show the Active and Standby controller for your APs.

- Navigate to: **Managed Network→Dashboard→Access Points**
- In the upper right pulldown: **Default Columns → Custom Columns**

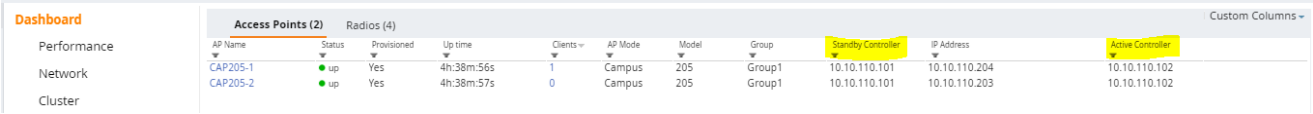


- In the pull-down menu: **Edit Current View**



- Move **Active Controller** to the Selected column
- Move **Standby Controller** to the Selected column
- Click **OK**

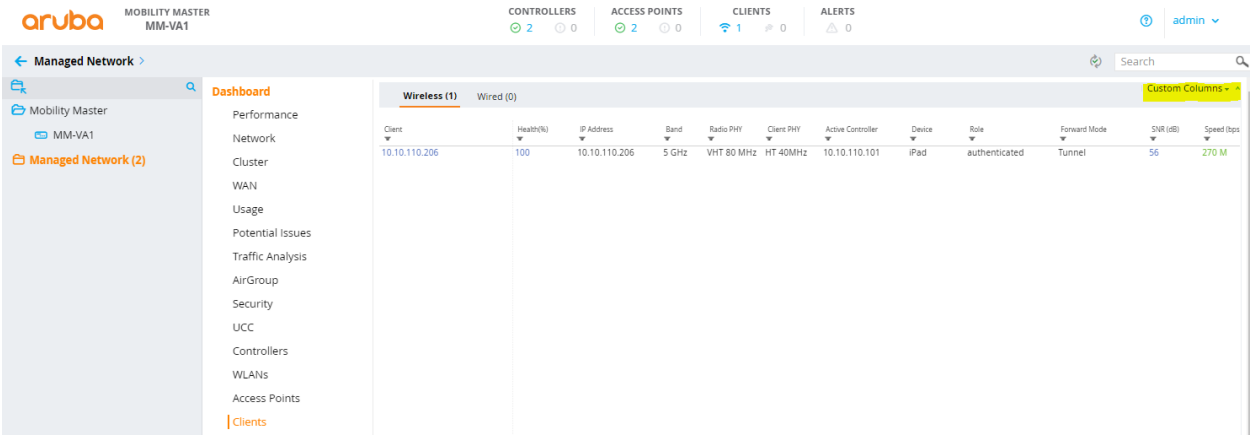
When you are returned to the AccessP Points panel, you will now see two additional columns that indicate the Active and Standby AP Anchor Controllers (AAC, S-AAC) for your Access Points.



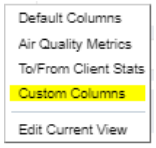
User Anchor Controllers

Customize your Dashboard to display the current status of your Client's Active and Standby Controllers. When complete, your custom view should show the Active and Standby Anchor controllers for Clients.

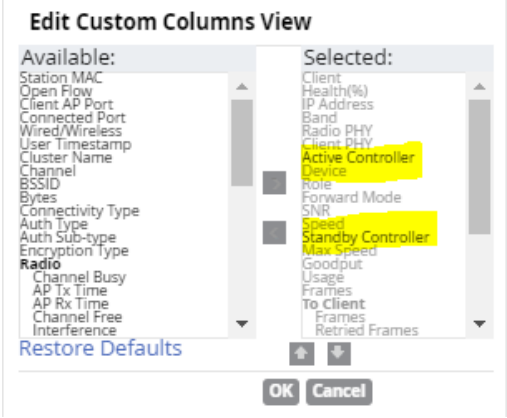
- Navigate to: **Managed Network→Dashboard→Clients**
- In the upper right pulldown: **Default Columns → Custom Columns**



- In the pull-down menu: **Edit Current View**

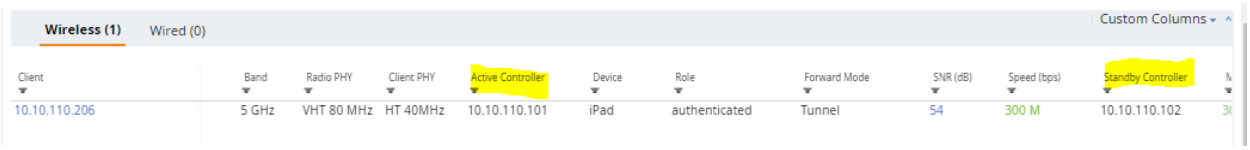


- Move **Active Controller** to the Selected column
- Move **Standby Controller** to the Selected column
- Click **OK**



When you are returned to the Clients panel, you will now see two additional columns that indicate the Active and Standby User Anchor Controllers (UAC, S-UAC) for your Clients.

- Make a note of which is your client's UAC (User Active Controller)



Controller Failover Test

Here, we test a controller failure scenario and verify no service disruption.

- Using your client, associate to one of your WLAN services and start a session. Ideally this would be a streaming service like YouTube, etc. If Internet connectivity is not available in your lab, start a continuous ping to the Workshop's Server 10.10.1.10.
- Using the Dashboard, determine which of your 7005's is the "active" controller for your client session.
- Simulate a controller failure by unplugging the Ethernet cable from Port 0 of the UAC (User Anchor Controller) for your client.
- How was service disrupted (how many pings did you drop)?
- Plug your downed controller back into your POE switch and observe the cluster reform and Active and Standby Controller connections re-establish for your AP and User sessions. Review the Dashboard views earlier in this exercise to verify active and standby anchor points are present after the controllers re-form a cluster.

Appendix A - Convert IAP to CAP

If you have an Aruba Instant AP, use these steps to convert your Instant AP (IAP) to a Campus AP (CAP). Once converted the AP will be configured and maintained from the controller.

AP Reset

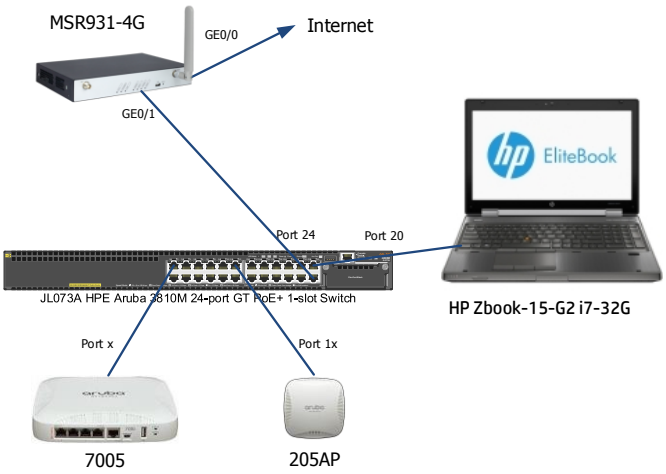
- Connect a console cable to your AP and open a terminal session.
- Using a paper clip, press and hold the reset button on the back of the AP.
- Connect your AP to a port for your group on the lab's core switch as shown in Figure 1.
- Wait for 10 full seconds while the AP boots, then release the reset button (paper clip)
- Monitor the AP boot process on the console. After about 2 minutes, log into the AP.
    - User: **admin**
    - Password: **admin**
- Determine what the IP Address was issued by the DHCP server:
    - **`show ip interfaces`**
    - Verify you can ping the controller from the Instant AP CLI: **`ping 10.10.1X0.99`**

    - Record the IP address that was assigned to the Instant AP:

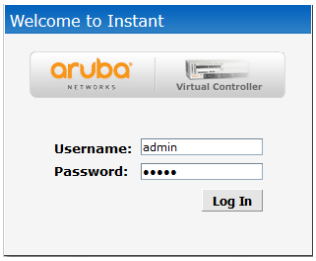
      _____

    - Record the MAC address of the Instant AP:

      _____

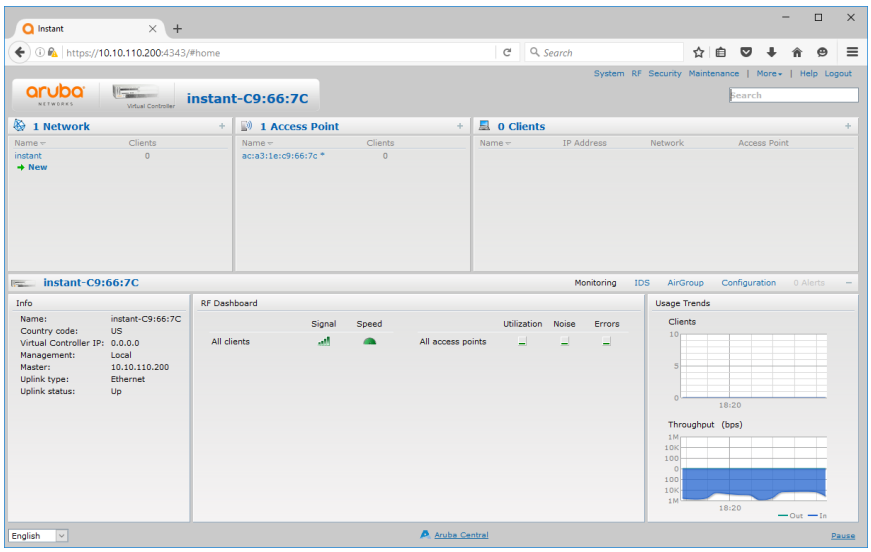


- Using a browser connect to the Instant AP: **http://10.10.1X0.x** where x is the IP address of the IAP.
- Log into the IAP
  - Username: **admin**
  - Password: **admin**



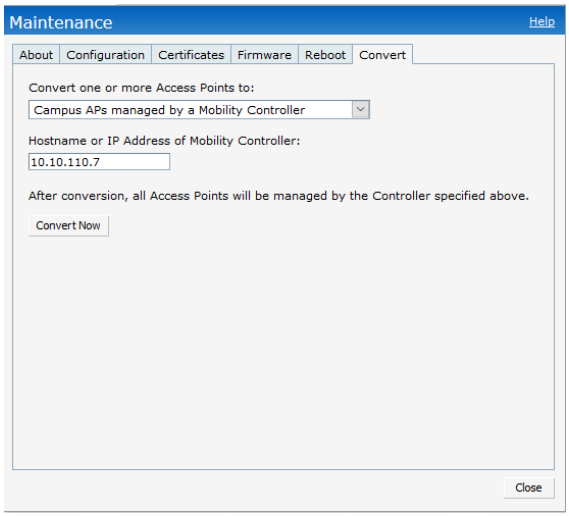
You are greeted with the Instant Home Page

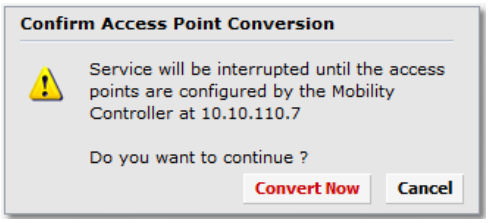
- Navigate to **Maintenance>Convert**



In the Maintenance→Convert tab:

- Convert one or more Access Points to: **Campus APs managed by a Mobility Controller**
- Hostname or IP Address of Mobility Controller: **10.10.1X0.99**
- Click **Convert Now**
- After about a minute, the AP will reboot, when it returns it will connect with the controller.





Appendix Z – Versions

Document version 1.4

Aruba OS 8.3.0.0_64659

Changes:

Shortened SSID names.

Added information about system clock settings.