

# Cloudpath Enrollment System MAC Registration Configuration Guide, 5.6

Supporting Cloudpath Software Release 5.6

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# Overview

Using 802.1X authentication with WPA2-Enterprise provides the best security option for wireless devices on your network. However, for devices that do not have 802.1X support, such as gaming consoles or printers, Cloudpath offers a method for registering these devices on the network.

MAC registration allows network access to devices that do not have the 802.1X supplicant capability. The registration process provides authentication using the device's MAC address to allow limited, and secure, network access.

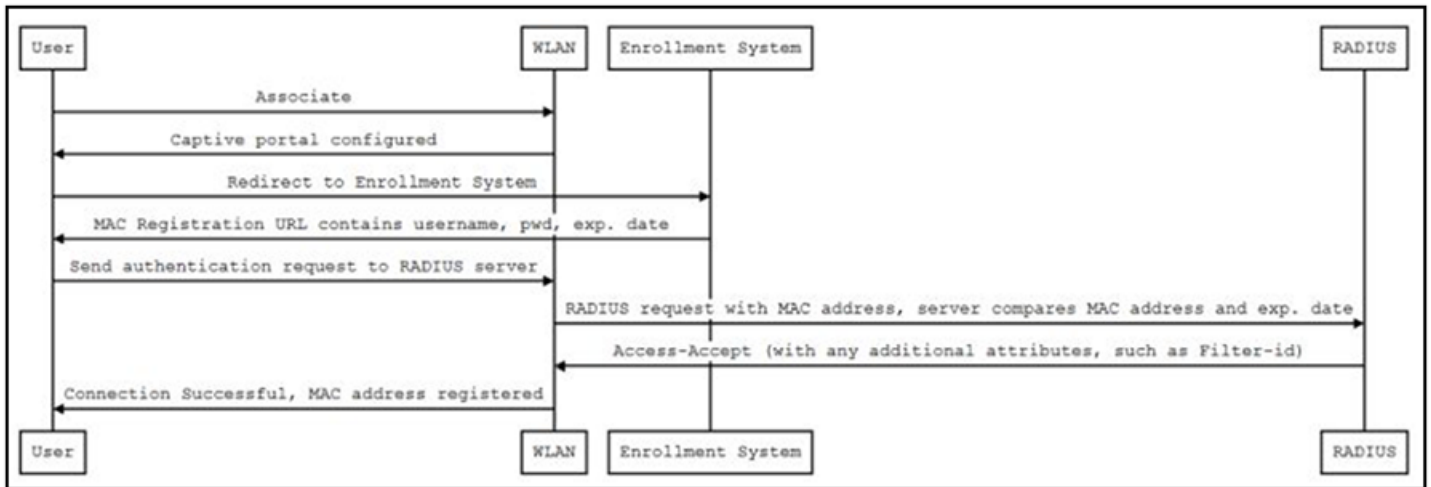
When setting up MAC registration, a list of authorized MAC addresses is maintained on the RADIUS server. When a non-802.1X device attempts to connect to the network, the request is forwarded to the RADIUS server, where the device is checked against the list of authorized MAC addresses. If the registration is not expired, the RADIUS server authenticates the device and sends a redirect URL, which points to the Cloudpath Enrollment System (ES) for onboarding to the secure network.

This document describes how to configure Cloudpath and a Wireless LAN Controller to support MAC Registration.

# MAC Registration Process

In this example, the user attempts to access the Internet, is redirected to the captive portal on Cloudpath and proceeds through the enrollment workflow, during which, the user is prompted for information.

**FIGURE 1** MAC Registration Sequence



At the MAC registration step, Cloudpath sends a registration URL to the client for use in the RADIUS authentication request. The registration URL contains the username, password, and validity period for the MAC registration.

The access point obtains the MAC address of the user device and sends this information in the RADIUS request to the RADIUS server. The RADIUS server compares the MAC address and expiration date with existing user information. If the validity period and expiration period matches, the RADIUS server authorizes the authentication and returns an Access-Accept to the access point. If other RADIUS attributes are configured, such as the Filter-Id, they are returned with the Access-Accept.

Subsequent access requests from the user to the access point cause the AP to open the firewall to allow access to the Internet. This occurs until the validity period expires and the user must re-enroll.

# Configuring Ruckus Controllers for MAC Registration

This section describes how to configure the Ruckus Zone Director, SmartZone, and Unleashed controllers for MAC registration, authenticating devices against a RADIUS server.

The screen shots and corresponding instructions about the controllers are based on the following Ruckus Controller versions:

- ZoneDirector 10.1.1
- Virtual SmartZone 3.6.0 (High Scale)
- Unleashed 200.6

If you are using different versions of any controller, please consult your controller documentation because you may encounter some differences in the user interface.

If your environment uses Cisco controllers, see [Configuring a Cisco Controller for MAC Registration](#) on page 40.

## Setting up Cloudpath as an AAA Authentication Server

Create an AAA authentication server for the Cloudpath onboard RADIUS server. The following images show this configuration on the Ruckus ZoneDirector, SmartZone, and Unleashed controllers.

On ZoneDirector, go to **Services & Profiles > AAA Servers**. On SmartZone, go to **Services & Profiles > Authentication**. On Unleashed, go to **Admin & Services > Services > AAA Servers > Authentication Servers**.

**FIGURE 2** Create AAA Authentication Server on ZoneDirector

**Create New**

Name	<input type="text" value="R-AOnboard"/>
Type	<input type="radio"/> Active Directory <input type="radio"/> LDAP <input checked="" type="radio"/> RADIUS <input type="radio"/> RADIUS Accounting <input type="radio"/> TACACS+
Encryption	<input type="checkbox"/> TLS
Auth Method	<input checked="" type="radio"/> PAP <input type="radio"/> CHAP
Backup RADIUS	<input type="checkbox"/> Enable Backup RADIUS support
IP Address*	<input type="text" value="192.168.5.73"/>
Port*	<input type="text" value="1812"/>
Shared Secret*	<input type="password" value="*****"/>
Confirm Secret*	<input type="password" value="*****"/>
<b>Retry Policy</b>	
Request Timeout*	<input type="text" value="3"/> seconds
Max Number of Retries*	<input type="text" value="2"/> times

FIGURE 3 Create AAA Authentication Server on SmartZone

**Create AAA Server**

**General Options**

Name: Lab AAA Auth

Description:

Type:  RADIUS  Active Directory  LDAP

Backup RADIUS:  Enable Secondary Server

**Primary Server**

IP Address: 72.18.151.56

Port: 1812

Shared Secret: .....

Confirm Secret: .....

**User Role Mapping**

OK Cancel

FIGURE 4 Create AAA Authentication Server on Unleashed

**Create New**

Name

Type  Active Directory  RADIUS  RADIUS Accounting

Encryption  TLS

Auth Method  PAP  CHAP

Backup RADIUS  Enable Backup RADIUS support

IP Address\*

Port\*

Shared Secret\*

Confirm Secret\*

Retry Policy

Request Timeout\*  seconds

Max Number of Retries\*  times

Enter the following values for the **Authentication** Server:

1. Name
2. Type = RADIUS
3. Auth Method (not applicable for SmartZone) = PAP
4. IP address = The IP address of the Cloudpath ES.
5. Port = 1812
6. Shared Secret = This must match the shared secret for the Cloudpath ES onboard RADIUS server. (**Configuration > RADIUS Server**).
7. Leave the default values for the remaining fields.

## Creating AAA Accounting Server (Optional)

Use the same process to create the AAA Accounting Server.

### NOTE

To navigate to the correct screen on Ruckus SmartZone, go to **Services & Profiles > Accounting**.

Enter the following values for the **Accounting** Server:

1. Name
2. Type = RADIUS ACCOUNTING.
3. IP address = The IP address of the Cloudpath ES.



4. Port = 1813

**NOTE**

The Authentication server uses port 1812. The Accounting server uses port 1813.

5. Shared Secret = This must match the shared secret for the Cloudpath ES onboard RADIUS server. (**Configuration > RADIUS Server**)
6. Leave the default values for the remaining fields.

## Running Authentication Test

You can test the connection between the controller and the Cloudpath ES RADIUS server.

Follow the instructions for the applicable controller. For the possible results, see [Possible Results from Authentication Test](#).

### ZoneDirector

At the bottom of the AAA server page, there is a section called "Test Authentication/Accounting Servers Settings." The Test Against field should be Local Database, as shown below. Enter a test User Name and Password, then click the **Test** button.

**FIGURE 5** Authentication Test on ZoneDirector

**Test Authentication/Accounting Servers Settings**

You may test your authentication server settings by providing a user name and password here. Groups to which the user belongs will be returned and you can use them to configure the role.

**Test Against** Local Database ▾

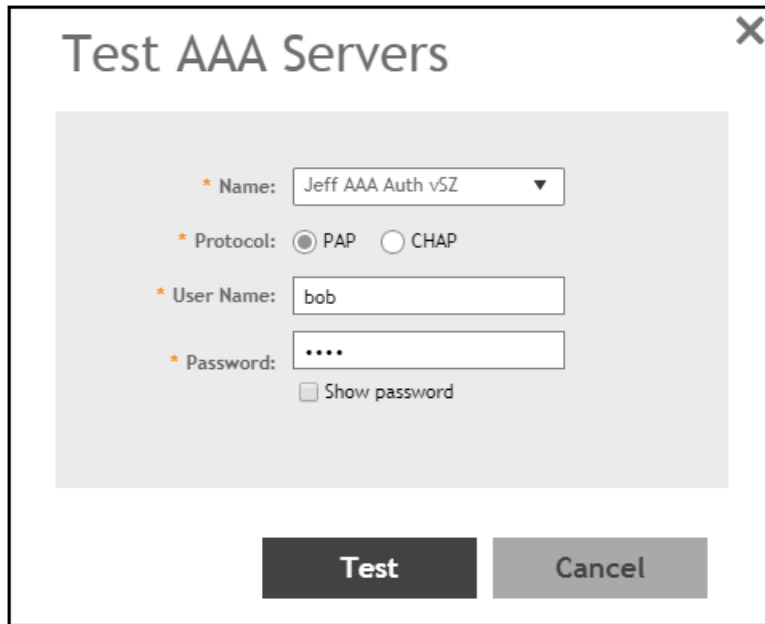
**Username**

**Password**

### SmartZone

When you save a configuration for an AAA Authentication server in SmartZone, you can click the **Test AAA** tab at the top of the screen, select the server from the drop-down list, enter your credentials, then click the **Test** button.

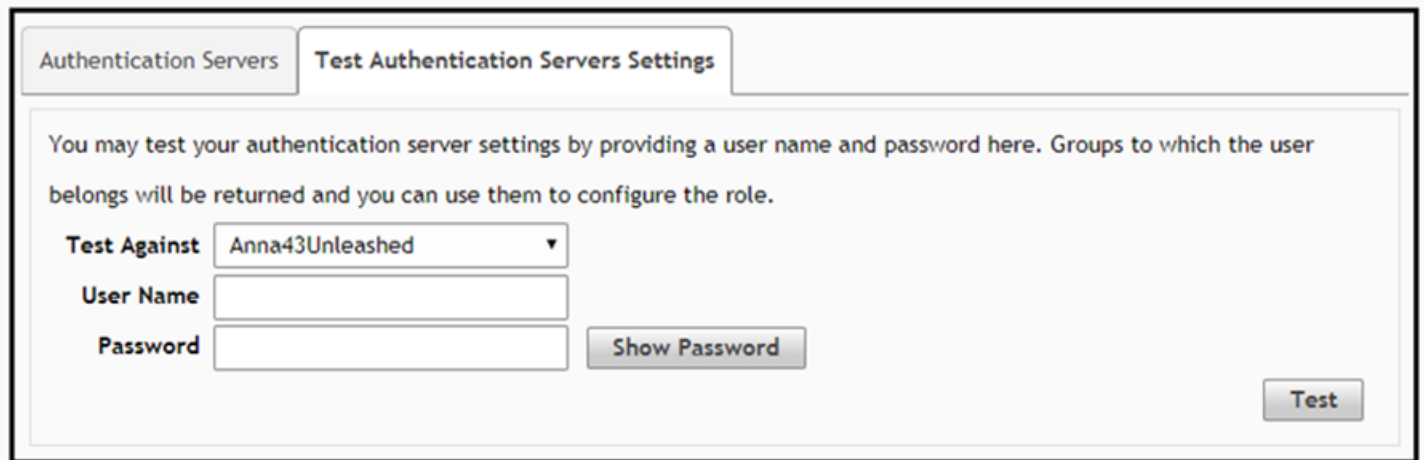
**FIGURE 6** Authentication Test on SmartZone



### **Unleashed**

Enter the test credentials on the Test Authentication Servers Settings tab, then click the **Test** button.

**FIGURE 7** Authentication Test on Unleashed



### **Possible Results from Authentication Test**

If you run the authentication test, you receive one of these responses:

- Failed! Connection timed out
- Failed! Invalid username and password

- Authentication Failed

The only one of these responses that means that connectivity was established is:

Failed! Invalid username or password

## Creating Hotspot Services

You can configure the Hotspot Service on the ZoneDirector, SmartZone, or Unleashed controllers.

1. Navigate to: For ZoneDirector, go to **Services & Profiles > Hotspot Services**. For SmartZone, go to **Services & Profiles > Hotspots & Portals > Hotspot WISPr**. For Unleashed, go to **Admin & Services > Services > Hotspot Services**, then use both the **General** tab and the **Authentication** tab, as instructed later in this section.

2. Name the Hotspot Service.

**FIGURE 8** Create Hotspot Service on ZoneDirector

The screenshot shows the 'Create New' configuration page for a hotspot service. The form is organized into several sections:

- Name:** A text input field containing 'Lab Hotspot Services'.
- Redirection:**
  - WISPr Smart Client Support:** Radio buttons for 'None' (selected), 'Enabled', and 'Only WISPr Smart Client allowed'.
  - Login Page\*:** A text input field with the value 'https://training.cloudpath.net/e' for authentication.
  - Start Page:** Radio buttons for 'redirect to the URL that the user intends to visit.' (selected) and 'redirect to the following URL:' with an empty text input field.
- User Session:**
  - Session Timeout:** A checkbox for 'Terminate user session after' with a value of '1440' minutes.
  - Grace Period:** A checkbox for 'Allow users to reconnect without re-authentication for' with a value of '30' minutes.
- Authentication/Accounting Servers:**
  - Authentication Server:** A dropdown menu showing 'Jeff AAA Auth'. Below it, a checked checkbox 'Enable MAC authentication bypass(no redirection)'. Two radio buttons: 'Use device MAC address as authentication password.' (selected) and 'Use [text input] as authentication password.'. A 'MAC Address Format' dropdown menu showing 'AA:BB:CC:DD:EE:FF'.
  - Accounting Server:** A dropdown menu showing 'Jeff AAA acct' and 'Send Interim-Update every' with a value of '5' minutes.
- Wireless Client Isolation:**
  - Two unchecked checkboxes: 'Isolate wireless client traffic from other clients on the same AP.' and 'Isolate wireless client traffic from all hosts on the same VLAN/subnet.'.
  - A dropdown menu for 'No WhiteList'.
  - Footnote: '(Requires whitelist for gateway and other allowed hosts.)'
- Location Information:** A collapsed section.
- Walled Garden:** A collapsed section.
- Restricted Subnet Access:** A collapsed section.
- Advanced Options:** A collapsed section.

At the bottom right, there are 'OK' and 'Cancel' buttons.

FIGURE 9 Create Hotspot WISPr on SmartZone

**Create Hotspot Portal**

**General Options**

Portal Name: Lab Hotspot Services  
Portal Description:

**Redirection**

Smart Client Support:  None  Enable  Only Smart Client Allowed

Logon URL:  Internal  External

Redirect unauthenticated user to the URL for authentication: https://training.cloudpath.net/enroll/TrainingTest/Produc

Redirected MAC Format: AA:BB:CC:DD:EE:FF

Start Page: After user is authenticated,  
 Redirect to the URL that user intends to visit.  Redirect to the following URL:

HTTPS Redirect:  If enabled, the AP will try to redirect HTTPS requests to the hotspot portal

**User Session**

Session Timeout: 1440 Minutes (2-14400)  
Grace Period: 60 Minutes (1-14399)

**Location Information**

Location ID: (example: isocc=us,cc=1,ac=408,network=ACMEWISP\_NewarkAirport)  
Location Name: (example: ACMEWISP,Gate\_14\_Terminal\_C\_of\_Newark\_Airport)

**Walled Garden**

OK Cancel

FIGURE 10 Create Hotspot Service on Unleashed - General Tab

The screenshot shows a 'Create New' dialog box with a close button (X) in the top right corner. The dialog has four tabs: 'General', 'Authentication', 'WalledGarden', and 'Policy'. The 'General' tab is selected and contains the following configuration options:

- Name:** A text input field containing 'Anna43HS'.
- Redirection:**
  - WISPr Smart Client Support:** Radio buttons for 'None' (selected), 'Enabled', and 'Only WISPr Smart Client allowed'.
  - Login Page:** 'Redirect unauthenticated user to  for authentication.'
  - Start Page:** 'After user is authenticated,'
    - Radio buttons for 'redirect to the URL that the user intends to visit.' (selected) and 'redirect to the following URL:
- User Session:**
  - Session Timeout:** '(Requires whitelist for gateway and other allowed hosts.)'
    - Checkbox 'Terminate user session after  minutes' is unchecked.
  - Grace Period:** 'Allow users to reconnect without re-authentication for  minutes' is unchecked.
  - Intrusion Prevention:** 'Temporarily block Hotspot clients with repeated authentication attempts.' is checked.

At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

**FIGURE 11** Create Hotspot Service on Unleashed - Authentication Tab

The screenshot displays the 'Authentication' configuration page for a Hotspot Service. It features three main sections: 'Authentication/Accounting Servers', 'Wireless Client Isolation', and 'Location Information'. The 'Authentication/Accounting Servers' section includes a dropdown for the 'Authentication Server' (set to 'Anna43Unleashed'), a 'Create New' button, and three radio button options for authentication methods. The first option, 'Enable MAC authentication bypass(no redirection)', is selected. Below it is a 'MAC Address Format' dropdown set to 'AA:BB:CC:DD:EE:FF'. The 'Accounting Server' dropdown is set to 'Anna43UnleashedACCT', also with a 'Create New' button. A 'Send Interim-Update every' field is set to '10' minutes. The 'Wireless Client Isolation' section contains two unchecked checkboxes and a 'No WhiteList' dropdown with a 'Create New' button. The 'Location Information' section has two empty text input fields for 'Location ID' and 'Location Name'. At the bottom right, there are 'OK' and 'Cancel' buttons.

3. Point the unauthenticated user to the **Cloudpath Enrollment Portal URL**, which can be found on the **Cloudpath Admin UI Configuration > Workflows** page, in the **Workflows** table.
4. Check **Redirect to the URL that the user intends to visit**.
5. Select the **Cloudpath RADIUS Authentication Server**. Applicable only for ZoneDirector and Unleashed (**Authentication** tab) in this screen.
6. Select **Enable MAC authentication bypass (no redirection)**. Applicable only for ZoneDirector and Unleashed (**Authentication** tab) in this screen. Selecting this field allows users with registered MAC addresses to be transparently authorized without having to log in.
7. For MAC Address Format (which appears when you select **Enable MAC authentication bypass (no redirection)** in the preceding step, it is recommended that you select the following option from the drop-down list: AA:BB:CC:DD:EE:FF
8. Select the **Cloudpath RADIUS Accounting Server**. Applicable only for ZoneDirector and Unleashed (**Authentication** tab).
9. Leave the defaults for the remaining settings. Click **OK**.

## Setting Up the Walled Garden

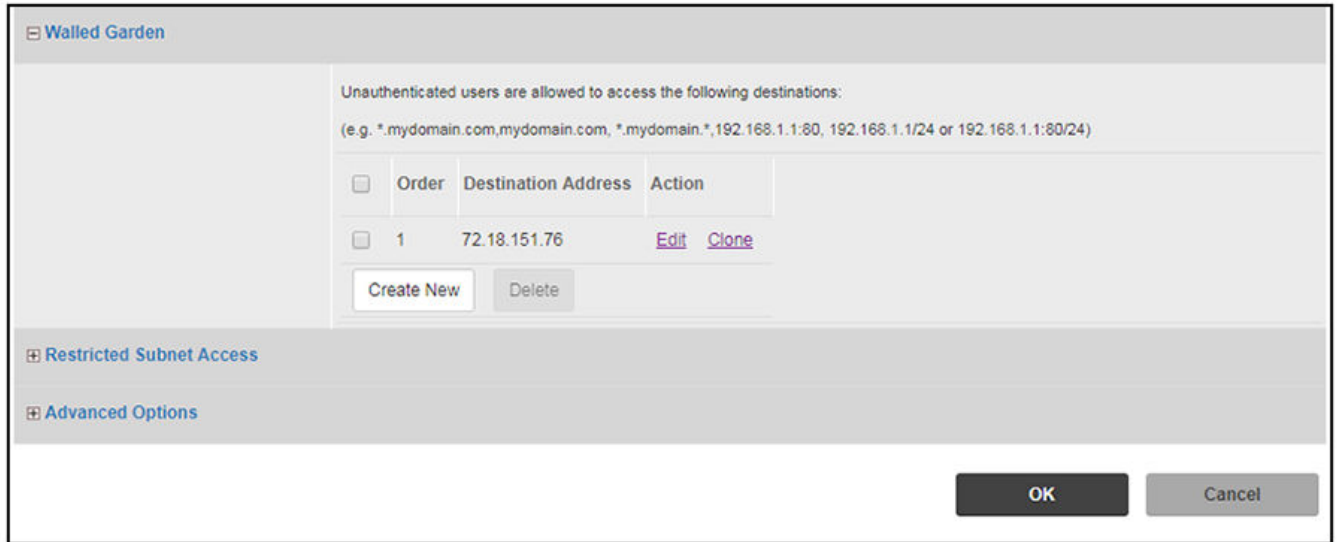
Perform the following steps to add a walled garden configuration to your existing Hotspot Services configuration:

1. Navigate to: For ZoneDirector, go to **Services & Profiles > Hotspot Services**. For SmartZone, go to **Services & Profiles > Hotspots & Portals > Hotspot WISPr**. For Unleashed, go to **Admin & Services > Services > Hotspot Services**.

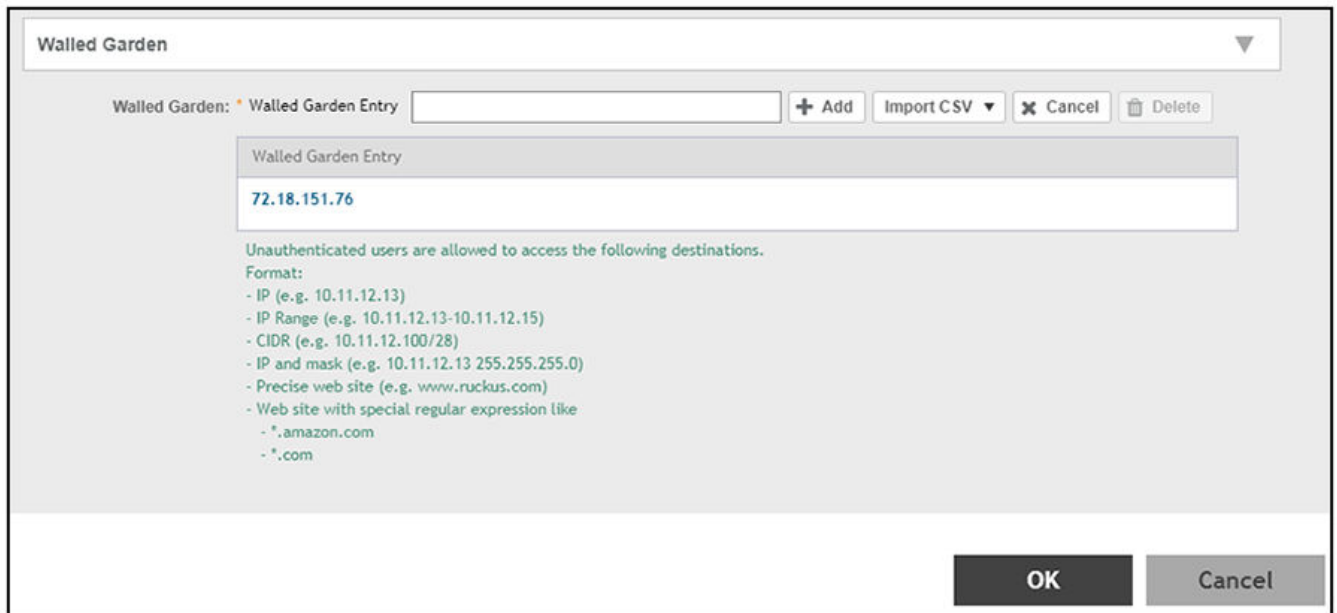


- For ZoneDirector and SmartZone, use the **edit** function on the existing Hotspot Services configuration, then scroll to the **Walled Garden** section and expand this section. For Unleashed, click the **WalledGarden** on the existing Hotspot Services configuration.

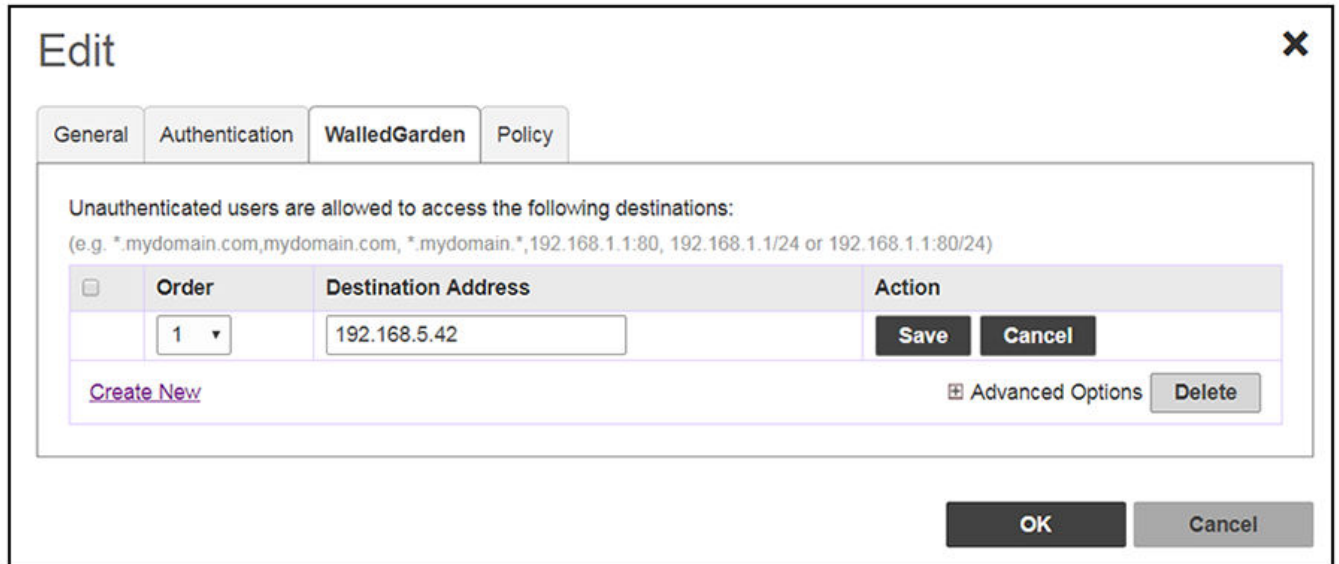
**FIGURE 12** Walled Garden Configuration for ZoneDirector



**FIGURE 13** Walled Garden Configuration for SmartZone



**FIGURE 14** Walled Garden Configuration for Unleashed



3. Include the DNS or IP address of the Cloudpath system, then click **OK**.
4. Optionally, there are some domains that you can add to the walled garden on all controllers to:
  - Prevent the Apple CNA mini-browser from appearing on Apple devices.
  - Avoid being blocked or slowed when attempting to download the Cloudpath wizard.

**NOTE**

There will still be about a 15-to-20-second delay when the full application is 33 percent complete (about 40 MB) in its download.

The recommended destinations to add for the walled garden are:

```
*.ggpht.com
*.play.googleapis.com
*.googleapis.com
*.play.google.com
android.clients.google.com
*.gvt1.com
connectivitycheck.android.com
connectivitycheck.google.com
*.gstatic.com
*.clients3.google.com
*.thawte.com
```

**NOTE**

The *\*thawte.com* destination is the OCSP URL of the SSL certificate of the Cloudpath server. This URL can be found by clicking the *lock* icon in your web browser and viewing the details of your certificate.

5. If you are still experiencing issues, you can try adding the following destinations to the walled garden:

```
*.clients.google.com  
*.l.google.com  
*.googleusercontent.com  
*.appengine.google.com  
*.cloud.google.com  
*.android.com  
*.cloudfront.net  
*.akamaihd.net  
172.217.0.0/16  
216.58.0.0/16
```

## Creating the Onboarding SSID

To configure the onboarding SSID, navigate to: For ZoneDirector and SmartZone, go to the Wireless LANS section of the controller UI; for Unleashed, go to **Wifi Networks** to create the WLAN.

1. Name the SSID.

- 2. Type=Hotspot Service (WISPr).

FIGURE 15 Onboarding SSID Configuration on ZoneDirector

**Create WLAN**

**General Options**

Name: Lab Onboard SSID  
ESSID: Lab Onboard SSID  
Description:

**WLAN Usages**

Type:  Standard Usage (For most regular wireless network usages.)  
 Guest Access (Guest access policies and access control will be applied.)  
 Hotspot Service (WISPr)  
 Hotspot 2.0  
 Autonomous  
 Social Media  
 WeChat

**Authentication Options**

Method:  Open  802.1x EAP  MAC Address  802.1x EAP + MAC Address  
Fast BSS Transition:  Enable 802.11r FT Roaming (Recommended to enable 802.11k Neighbor-list Report for assistant.)

**Encryption Options**

Method:  WPA2  WPA-Mixed  WEP-64 (40 bit)  WEP-128 (104 bit)  None

**Options**

Hotspot Services: Lab Hotspot Services Create New  
Priority:  High  Low

**Advanced Options**

OK Cancel

FIGURE 16 Onboarding SSID Configuration on SmartZone

**Create WLAN Configuration**

**General Options**

- Name: Lab Onboard SSID
- SSID: Lab Onboard SSID
- Description:
- Zone: Default
- WLAN Group: default **Create**

**Authentication Options**

- Authentication Type:  Standard usage (for most regular wireless networks)  Hotspot (HSP)  Guest Access  Web Authentication
- Hotspot 2.0 Access  Hotspot 2.0 Onboarding  WiChat
- Method:  Open  802.1X EAP  MAC Address  802.1X R MAC
- MAC Authentication:  Use user-defined text as authentication password (default is device MAC address):
- MAC Address Format: AA:BB:CC:DD:EE:FF

**Encryption Options**

- Method:  WPA2  WPA-Mixed  WEP-64 (40 bits)  WEP-128 (104 bits)  None

**Data Plane Options**

- Access Network:  Tunnel WLAN traffic through Ruckus GRE

**Hotspot Portal**

- Hotspot (HSP) Portal: Lab Hotspot Services **Create**
- Bypass CNA:  Enable
- Authentication Service:  Use the controller as proxy  Use RADIUS-based profile
- Just AAA Auth v52 **Create**
- Accounting Service:  Use the controller as proxy
- Just AAA Acct v52 **Create** Send interim update every: 10 Minutes (0-1440)

**Options**

- Acct Delay Time:  Enable
- Wireless Client Isolation:  Disable  Enable (isolate wireless client traffic from all hosts on the same VLAN/subnet)
- Isolation Whitelist: Gateway Only (Automatic) **Create**  
(The whitelist requires entries for the subnet, gateway and other allowed hosts.)  
(The whitelist can only contain wired destinations, wireless clients are not supported on the whitelist.)
- Priority:  High  Low

**RADIUS Options**

**Advanced Options**

**OK** **Cancel**

**FIGURE 17** Onboarding SSID Configuration for Unleashed

The screenshot shows a 'Create WLAN' dialog box. At the top left is the title 'Create WLAN' and a close button 'X' at the top right. The main area contains the following fields and options:

- Name:** A text input field containing 'Anna43UnleashedOB'.
- Usage Type:** A group of radio buttons with the following options:
  - Standard for most regular wireless network usage
  - Guest Access guest access policies and access control will be applied
  - Hotspot Service known as WISPr
  - Social Media authenticate through social media network
  - WeChat
- Hotspot Services:** A dropdown menu showing 'Anna43HS' and a 'Create New' button to its right.

At the bottom left is a 'Show Advanced Options' link with a right-pointing arrow. At the bottom right are two buttons: 'OK' (dark grey) and 'Cancel' (light grey).

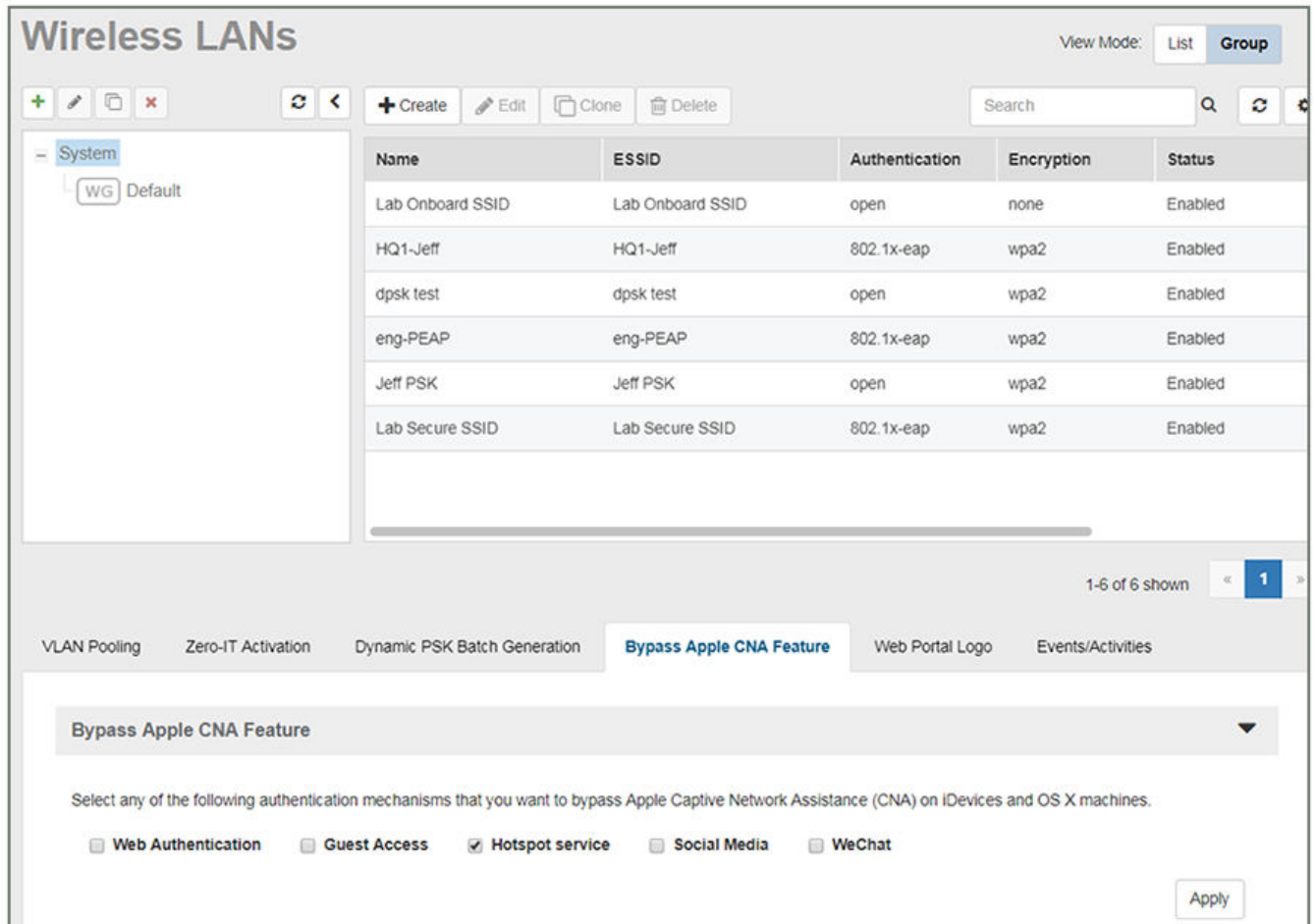
3. Authentication Options Method=Open for ZoneDirector, MAC Address for SmartZone. (Not applicable for Unleashed.)
4. The checkbox next to MAC Authentication (SmartZone only) called "Use user defined text as authentication password (default is device MAC address):" can be left unchecked.
5. The MAC Address Format (SmartZone only) recommended selection is: AA:BB:CC:DD:EE:FF. This is the default for most RADIUS servers.
6. Encryption Options Method=None (ZoneDirector and SmartZone).
7. Select the Hotspot Service from the drop-down list that you should already have created in a previous step procedure.
8. Enable the **Bypass CNA** feature as follows, depending on the controller:
  - For SmartZone: Check the box to enable "Bypass CNA," as shown in [Figure 16](#).
  - For ZoneDirector, after you finish configuring the onboarding SSID, refer to [Figure 18](#) on page 23.
  - For Unleashed, after you finish configuring the onboarding SSID, refer to [Figure 20](#) on page 24.
9. Select the Cloudpath RADIUS Authentication Server (SmartZone only).
10. Select the Cloudpath RADIUS Accounting Server (SmartZone only).
11. Leave the defaults for the remaining settings and click **OK** (or **Apply**).

## Enabling Bypass CNA on ZoneDirector

It is recommended to enable the "Bypass Apple CNA Feature," which you can do globally for wireless LANs in ZoneDirector.

1. In the Wireless LANs main screen, click on **Bypass Apple CNA Feature**, as shown in the following figure:

**FIGURE 18** Enabling the Bypass Apple CNA Feature Globally on ZoneDirector



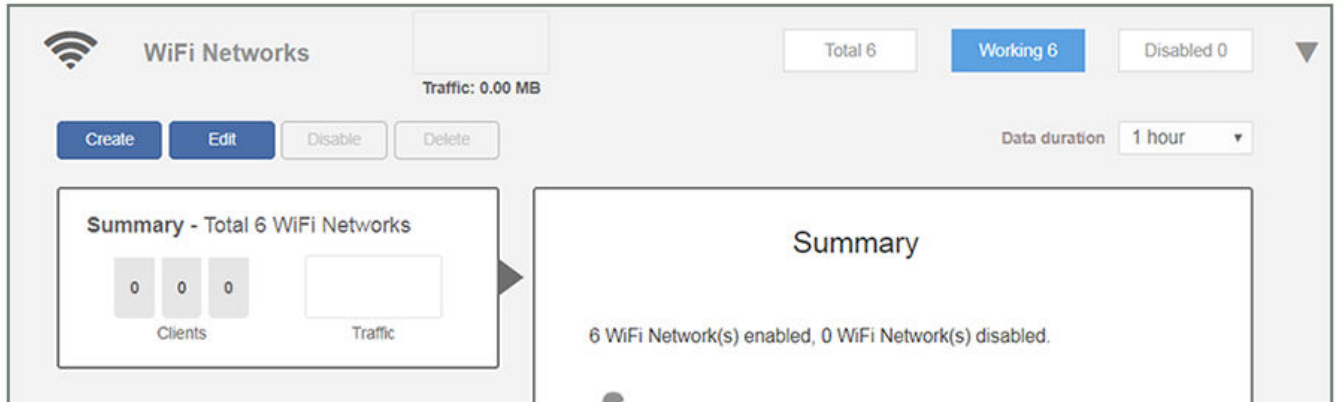
2. In the "Bypass Apple CNA Feature" area of the screen, check the "Hotspot service" box.
3. Click **Apply** to enable the "Bypass Apple CNA Feature" globally on all Wireless LANs that are configured as type "Hotspot Service (WISPr)."

## Enabling Bypass CNA on Unleashed

It is recommended to enable the "Bypass Apple CNA Feature," which you can do globally for wireless LANs in Unleashed.

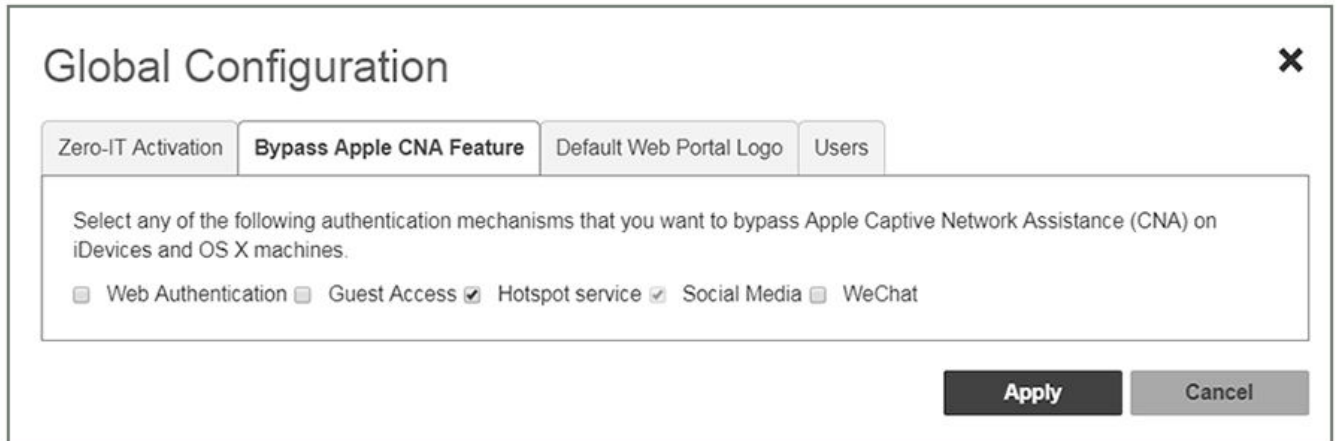
1. In the WiFi Networks main screen (see figure below), click **Edit**.

**FIGURE 19** Clicking the Edit Button Brings you to Global Configuration



2. In the Global Configuration screen that pops up, click **Bypass Apple CNA Feature**.

**FIGURE 20** Enabling the Bypass Apple CNA Feature Globally on Unleashed



3. In the "Bypass Apple CNA Feature" area of the screen, check the "Hotspot service" box.
4. Click **Apply** to enable the "Bypass Apple CNA Feature" globally on all Wireless LANs that are configured as type "Hotspot Service (WISPr)."

## Cloudpath Configuration

This section describes how to create a workflow for MAC registration, add RADIUS attributes to a MAC registration configuration, and how to import a file of MAC addresses to a MAC registration list.



## Create a MAC Registration Workflow

### NOTE

Creating this workflow includes a step for adding a MAC registration step. At that time, you have the option of creating a new registration configuration or selecting an existing configuration. If you want to create a registration configuration before creating your workflow, refer to [Using the MAC Registrations Main Page](#) on page 32

1. Go to **Configuration > Workflow** and select **Add Workflow**.
2. On the **Create Workflow** page, enter the new workflow information and **Save**.
3. Click **Get Started** to add a workflow step.
4. Add an **Acceptable Use Policy** for the network.
5. Click the **Insert** arrow to create a step in the enrollment workflow.
6. Add a step to split users into two branches.

**FIGURE 21** Create Split

**Create Split**

Display Name: MAC Registration Split

Description:

Match Behavior: Use All Options That Match

**Options**

The following settings will setup initial options for this split. To add additional options or to tune the option, use the options icon (3 horizontal lines) on the previous screen.

**Note:** Steps currently existing in the workflow below the point of insertion will be assigned to the Option 1 branch.

Step 2: Split users by: Option 1 Option 2 Option 3 Option 4

Option 1: Employees

Option 2: MAC Registered Devices

Option 3:

Option 4:

**Webpage Information**

If the user is prompted to select an option as part of this split, this information will display on the webpage. Additional option-specific information may be specified by editing the list.

Page Source: Standard Template

Title:


No Item Available Message: Sorry, no further options are available.


7. On the **Create Split** page, in the **Options** section, enter the names for the two workflow branches.  
For example, you can name Option 1, **Employees**, and Option 2, **MAC-Registered**.
8. Leave the defaults for the other fields and **Save**.

The named branches appear as tabs in the split workflow step.

The remaining sections describe how to configure the **MAC Registered** workflow. The **Employees** workflow is configured per your network needs.

### ***How to Create a Filter in the Workflow for MAC-Registered Devices***

The filter icon  on the MAC Registration tab indicates that this option only applies to devices matching the filter criteria. A filter option does not display as a prompt to users during enrollment.

1. On the **workflow** page, select the **MAC Registration** tab, created in the previous section, and click the **Edit List** icon  .
2. Edit the **MAC Registration** option.

3. On the **Modify Option** page, open the **Filters and Restrictions** section. In the **MAC Registration List** field, leave the default, **Matches**, and enter the **Name** of the MAC Registration list to use for this workflow. This moves all devices in the specified MAC Registration list to the **MAC Registered** workflow branch.

**FIGURE 22** Modify Split Options

The screenshot displays the configuration interface for a workflow option. It is divided into two main sections: 'Webpage Display Information' and 'Filters & Restrictions'.

**Webpage Display Information:**

- Sample User Display:** A preview box showing 'Short Name' and 'Display Title'.
- Short Name:** Text input field containing 'MAC Registered Devices'.
- Display Title:** Text input field containing 'MAC Registered Devices'.
- Display Text:** A large text area for additional description.
- Enabled:** A checked checkbox.
- Icon File:** A section with a 'Default' dropdown set to 'Using default file.' and an 'Upload' section with a 'Choose File' button and 'No file chosen' text.

**Filters & Restrictions:**

The following settings control which users will have access to this option. If nothing is specified below, all users will have access to this option. If criteria is specified below, only users meeting the criteria will have access to this option.

**User-Based Filters:**

- Group Name Pattern:** Matches [ex. BYOD]
- Username Pattern:** Matches [ex. bob]
- User DN Pattern:** Matches [ex. 'ou=IT,']
- Email Pattern:** Matches [ex. '\*@company.com']

**Device-Based Filters:**

- Operating System Pattern:** Matches [ex. 'Android.']
- User-Agent Pattern:** Matches [ex. 'Safari.']
- Language Pattern:** Matches [ex. 'en.']
- MAC Registration List:** Matches [ex. IT-Owned MACs] (This row is highlighted with an orange border in the image)
- DHCP Summary Pattern:** Matches [ex. 'Windows.']

4. **Save** the changes to the option filter.
5. Click **Done** to return to the workflow.

### **How to Add a MAC Registration Step to the Workflow**

1. On the workflow page, click the **Insert** arrow to create a step. Enter the values in the Registration Information section in the enrollment workflow.

2. Select **Register device for MAC-based authentication**.
3. Create a new registration configuration. The **Create MAC Registration** page opens.

**FIGURE 23** Create MAC Registration

**Modify MAC Registration**

① Display Name:

① Description:

**Registration Information**

① SSID Regex:

① Expiration Date Basis:

① Behavior:

① Config Shortcuts:

① Redirect URL:

① Use POST:

① POST Parameters:

① Allow Continuation:

① Kill Session:

**Authentication Attributes**

Success Reply Attributes: When the RADIUS authentication is successful, an Access-Accept will be returned to the WLAN or wired infrastructure. If additional attributes are specified here, they will also be included in the reply.  
No additional attributes currently exist.

Failure Reply Attributes: When the RADIUS authentication is unsuccessful, an Access-Reject will be returned to the WLAN or wired infrastructure. If additional attributes are specified here, the reply will be an Access-Accept along with attributes specified here.  
No additional attributes currently exist.

4. Enter the **Name** and **Description** for the MAC Registration step.

5. Enter the values in the **Registration Information** section:

- SSID Regex - This is the SSID to which MAC registered devices are assigned.

**NOTE**

This field is case sensitive. Separate multiple SSIDs by a vertical pipe (|). The default (\*) is any SSID that is pointed at the RADIUS server.

- Expiration Date Basis - The basis for calculating the default validity period for MAC registration.

**NOTE**

A sponsor can override the validity period configured for MAC registration. See *Setting Up Sponsored Guest Access Within Cloudpath* guide, located on the **Support** tab, for details.

- Offset - The number of hours/days/months/etc to be offset from the event date when calculating the registration validity period. If **Specified Date** is selected, this should be the date in YYYY/MM/DD format.

**NOTE**

This field may disappear, depending on your selection for Expiration Date Basis. For example, in the screen shown above, "End of Day" has been selected for Expiration Date Basis, which makes the "Offset" field unnecessary.

- Behavior - Specifies the prompt and redirect settings for the MAC registration configuration. Use the **Web Page Information** section to configure the user prompt or redirect URL. Behavior settings include:
  - Prompt user when MAC is unknown.
  - Always prompt the user.
  - Redirect when MAC is unknown.
  - Always redirect to authenticate user. (This is the default and the most commonly used setting).
  - Skip registration when MAC is unknown.
- Use the **Config Shortcuts** buttons to populate the **Redirect URL** and **POST Parameters** according to your controller vendor and preferred protocol.
- Allow Continuation - If checked, the submit-redirect call is processed, if unchecked, the submit-redirect call is ignored.
- Kill Session - If checked, the user's session will be killed as they are redirected and, if they return, they will be forced to start over.

## Adding RADIUS Attributes

During association, the access point performs a MAC authentication with the RADIUS server. The RADIUS server looks up the MAC address, verifies that it has not expired, and returns an Access-Accept. If additional attributes are configured, they are returned with the **Access-Accept**.

1. In the **Authentication Attributes** section, click **Add Attribute** for Successful (or Unsuccessful) Attempts.
2. Enter the **Attribute, Operator, and Value**. The attribute is added to the MAC Registration configuration.

For example, to return a Filter-Id for a guest user, enter **Filter-Id** in the Attribute field, and **Guest** in the Value field. If the authentication request is authorized, the RADIUS server returns the **Filter- Id=Guest**, along with the **Access-Accept** attribute to the user device.

After the registration expires (or if an unregistered MAC address associates to the SSID), the RADIUS server replies with an **AccessReject**. If additional attributes are configured for unsuccessful authentications, they are returned with the **AccessReject**.

### **How to Add a Message to Users**

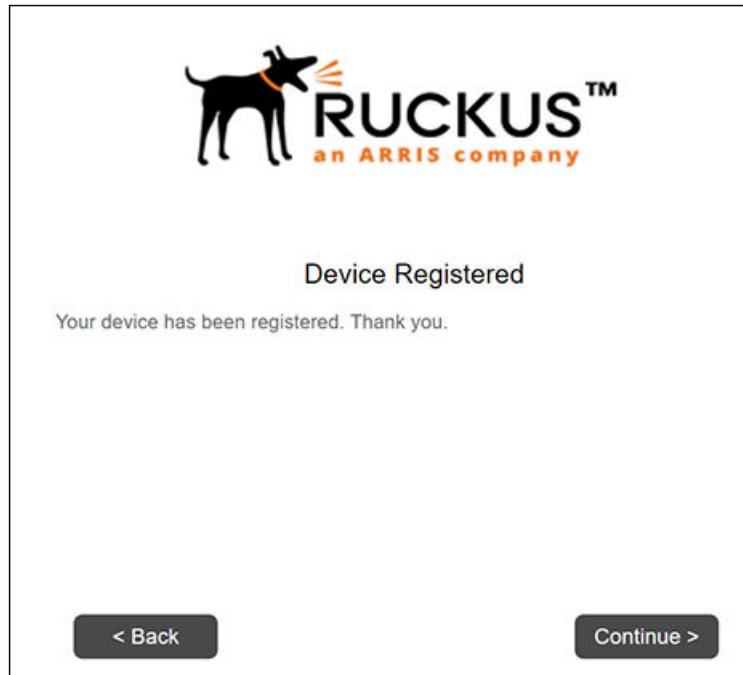
As a best practice, add a workflow step to display a message to the user indicating that the authentication was successful.

1. On the workflow page, click the **Insert** arrow to create a step in the enrollment workflow.
2. Select **Display a message**.
3. Create a new message from a standard template. On the **Create New Message** page, enter an appropriate **Title** and **Message**.
4. Uncheck the **Show Continue Button** box. After the message is displayed, the device should be moved to the specified SSID. No user action is required.

5. **Save** the configuration.

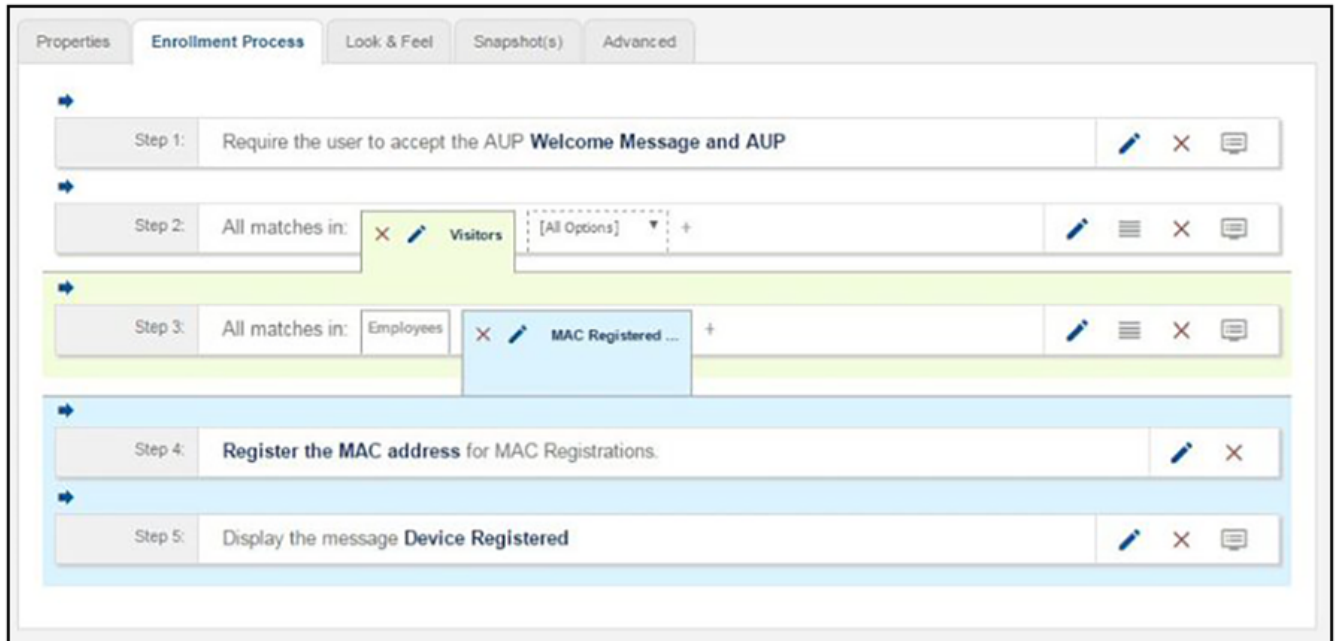
On the workflow page, click the **view** icon next to the **Display Message** step to see a preview of the message.

**FIGURE 24** Example Message to User



The completed workflow is displayed below.

**FIGURE 25** Completed Workflow for MAC Registration

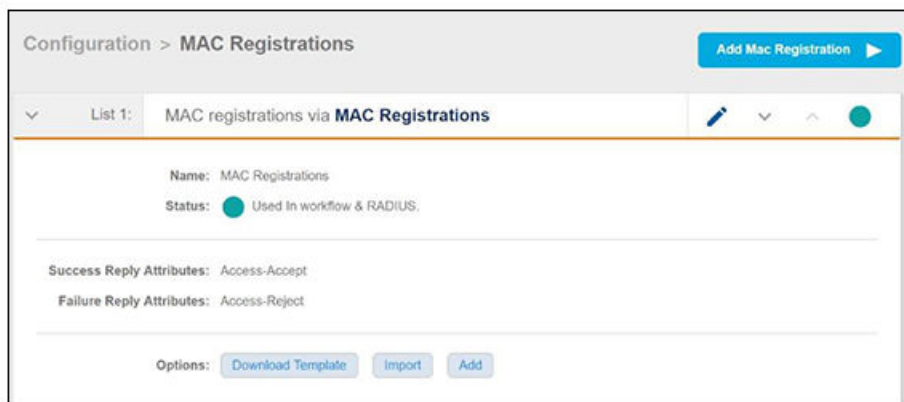


## Using the MAC Registrations Main Page

From the main MAC Registration page, you can create MAC registration configurations, and import MAC registration lists or individual MAC addresses into these configurations for use in a workflow.

Navigate to **Configuration > MAC Registrations**. The figure below shows the page as it would appear if you already were using a configuration called "MAC Registrations" in a workflow, as the green status circle indicates.

**FIGURE 26** MAC Registrations Main Page





## ***Adding a New MAC Registration Configuration***

Follow these steps to create a new MAC Registration configuration which you can then use to import MAC addresses.

1. Click **Add MAC Registration** in the upper right of the screen shown above.

2. In the Create MAC Registrations screen (see the example screen below), configure the values (described after the example screen), then click **Save**.

**FIGURE 27** Creating a New MAC Registration Configuration

Configuration > MAC Registrations > Create

Cancel Save

**Registration Information**

1 Display Name: MAC Registration-8

1 Description:

1 SSID Regexp: \*

1 Expiration Date Basis: Days After

1 Offset: 1

1 Behavior: Always redirect to authenticate user

1 Config Shortcuts: Ruckus SZ HTTP Ruckus ZD HTTP Cisco HTTP Aruba HTTP Aerohive HTTP  
Ruckus SZ HTTPS Ruckus ZD HTTPS Cisco HTTPS Aruba HTTPS Aerohive HTTPS  
Ruckus ICX Cisco Meraki

1 Redirect URL: https://HOSTNAME\_HERE:9998/SubscriberPortal/hotspotlogin

1 Use POST:

1 POST Parameters: username=\${USERNAME}  
password=\${PASSWORD}  
client\_mac=\${client\_mac}  
uip=\${uip}

1 Allow Continuation:

1 Kill Session:

**Authentication Attributes**

Success Reply Attributes: When the RADIUS authentication is successful, an Access-Accept will be returned to the WLAN or wired infrastructure. If additional attributes are specified here, they will also be included in the reply.  
No additional attributes currently exist.  
+

Failure Reply Attributes: When the RADIUS authentication is unsuccessful, an Access-Reject will be returned to the WLAN or wired infrastructure. If additional attributes are specified here, the reply will be an Access-Accept along with attributes specified here.  
No additional attributes currently exist.  
+

- Display Name: Any descriptive name you want.
- Description: Optional description of this particular MAC registration configuration.
- SSID Regexp: SSID to which MAC registered devices are assigned.

**NOTE**

This field is case sensitive. Separate multiple SSIDs by a vertical pipe (|). The default (\*) is any SSID that is pointed at the RADIUS server.

- Expiration Date Basis: The basis for calculating the default validity period for MAC registration.

**NOTE**

A sponsor can override the validity period configured for MAC registration. *Cloudpath Enrollment System Sponsored Guest Access Configuration Guide*, located on the **Support** tab, for details.

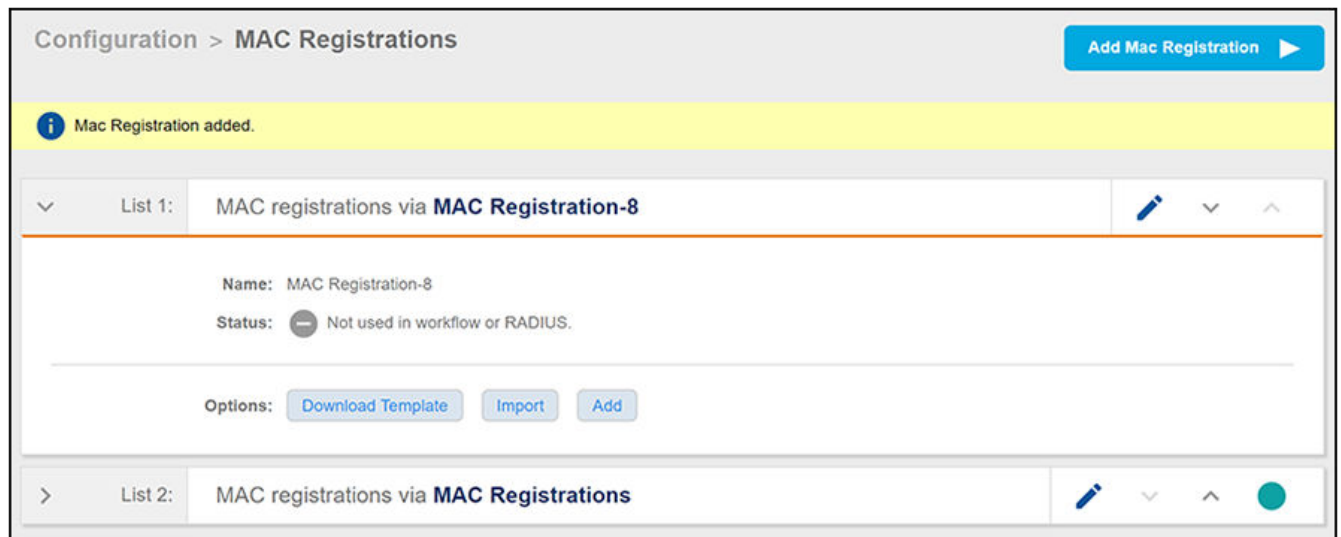
- Offset: The number of hours/days/months/etc to be offset from the event date when calculating the registration validity period. If **Specified Date** is selected, this should be the date in YYYY/MM/DD format.

**NOTE**

This field may be unnecessary and therefore disappear, depending on your selection for Expiration Date Basis.

- Behavior: Specifies the prompt and redirect settings for the MAC registration configuration. Use the **Web Page Information** section to configure the user prompt or redirect URL. Behavior settings include:
    - Prompt user when MAC is unknown.
    - Always prompt the user.
    - Redirect when MAC is unknown.
    - Always redirect to authenticate user. (This is the default and the most commonly used setting).
    - Skip registration when MAC is unknown.
  - Use the **Config Shortcuts** buttons to populate the **Redirect URL** and **POST Parameters** according to your controller vendor and preferred protocol.
  - Allow Continuation - If checked, the submit-redirect call is processed, if unchecked, the submit-redirect call is ignored.
  - Kill Session - If checked, the user's session will be killed as they are redirected and, if they return, they will be forced to start over.
  - Authentication Attributes: Refer to [Adding RADIUS Attributes](#) on page 29
3. After you click **Save**, you are returned to the main screen, with the new configuration (MAC Registration-8 in this example) appearing in the list, as shown below:

**FIGURE 28** MAC Registrations Page After Adding a Second Registration Configuration



## Importing a MAC Registration List

Follow these steps to import a MAC registration list into a MAC registration configuration.

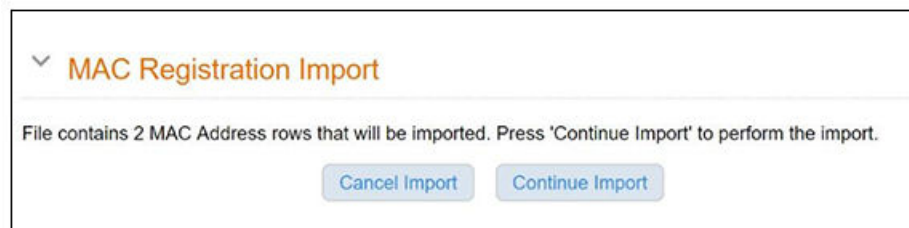
1. Open the MAC registration configuration in which you want to import a MAC address list. You may have to click the arrow to the left of the MAC registration list number to expand the list, thus displaying the option buttons of "Download Template," "Import," and "Add."
2. If you first need a template for adding MAC addresses to an .xls file, click **Download Template**.
3. Once you are ready to import the list of MAC addresses to the MAC registration list, click **Import**.

### NOTE

If importing from a .csv file, the following date formats are supported: yyyyMMdd, HHmmss, yyyyMMdd HHmm, yyyyMMdd, MM/dd/yyyy HHmmss, MM/dd/yyyy HHmm, MM/dd/yyyy, yyyy-MM-dd HH:mm:ss, yyyy-MM-dd.

4. Browse to select your MAC address list, then click **Continue**.
5. A popup message appears, where you click **Continue Import**:

**FIGURE 29** Popup Asking You to Confirm Import of MAC Address List File



6. The file is imported and the MAC addresses are added to the applicable MAC Registration list.

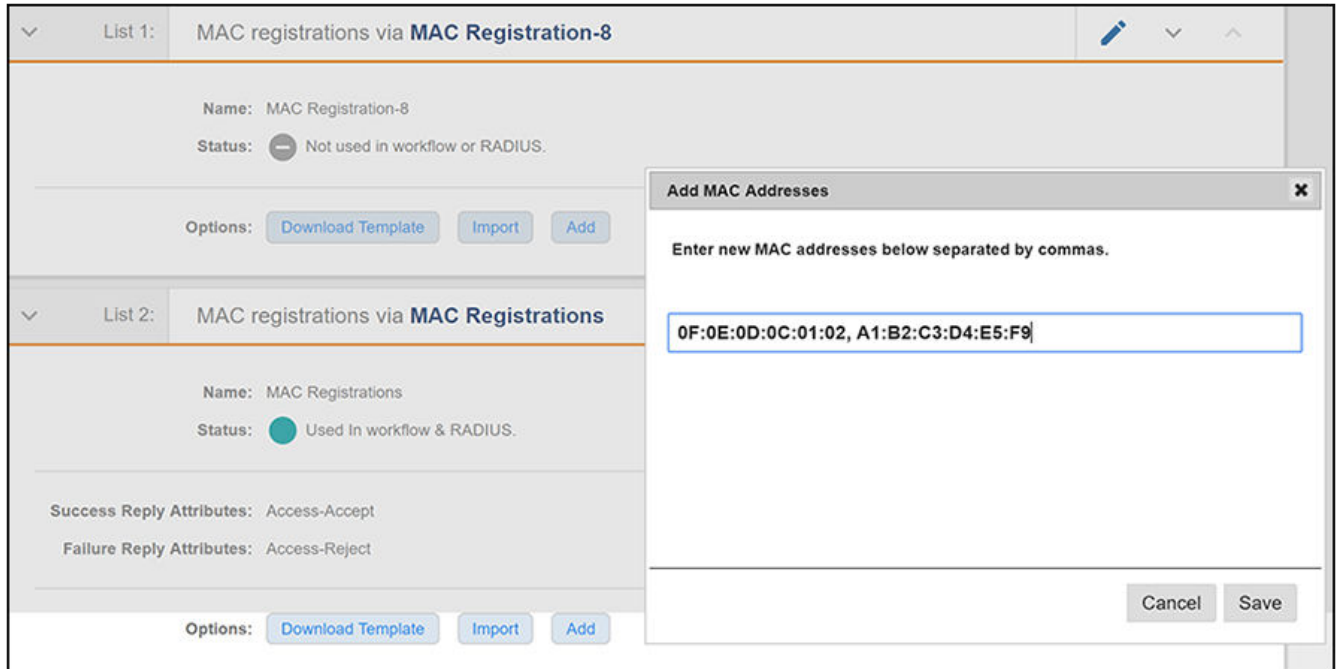
## Importing Individual MAC Addresses

Follow these steps to import individual MAC addresses into a MAC registration configuration.

1. Open the MAC registration configuration in which you want to import a MAC address list. You may have to click the arrow to the left of the MAC registration list number to expand the list, thus displaying the option buttons of "Download Template," "Import," and "Add."
2. Click **Add**.

3. In the popup window, enter the MAC addresses, separated by commas, that you wish to add:

**FIGURE 30** Entering Individual MAC Addresses



4. Click **Save**.
5. Confirm the import on the ensuing popup window.

You are returned to the main page, and there should be a confirmation message at the top, indicating that the MAC addresses have been successfully added.

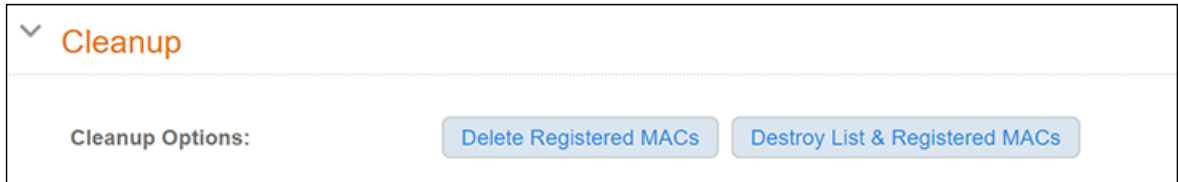
### **Removing a MAC Registration Configuration List or Its MAC Addresses**

Follow these steps to either remove the MAC addresses from a MAC registration configuration list or to remove both the MAC addresses and the list itself:

1. Click the pencil icon to the right of the desired list.

2. Scroll to the bottom of the screen until you get to the **Cleanup** area, and click **Cleanup** to display the options:

**FIGURE 31** Cleanup Options for MAC Registration Configuration List



**NOTE**

You cannot destroy the entire list if it is currently part of a workflow.

3. Click on the desired option.  
A Warning popup appears.
4. If you wish to continue, be sure to check the box to indicate that you "understand the warning," then click **Continue**.  
You are returned to the main screen, where you should see a message indicating that your action has taken effect.

## Viewing MAC Registration Records on the Dashboard

Administrators can view the records for devices that have been registered on the network using the MAC address, and, if needed, can revoke the registration.

### How to View MAC Registration Records

1. Go to **Dashboard > Users And Devices**, MAC Registrations tab.
2. The **MAC Registration** table shows the status and validity information for each MAC address. You can view active, expired, and revoked registrations, and sort the registration data using the table filters.

3. Click the **view** icon to see details.

**FIGURE 32** MAC Registrations on the Dashboard

The screenshot shows a dashboard with a navigation bar at the top containing 'Users', 'Device Types', 'Form Factors', and 'MAC Registrations'. Below the navigation bar are filter options: 'Show active' (checked), 'Show revoked', and 'Show expired'. The main content is a table with the following data:

	Status	MAC Address	Username	Registration Date	Expiration Date	Registration List
🔍	Active	4C:8D:79:E9:16:18	bob	20170504 0938 MDT	20200413 0000 MDT	MAC Registrations
🔍	Active	A5:B5:C5:D5:E5:F5	mike	20170504 0938 MDT	20200412 0000 MDT	MAC Registrations
🔍	Active	A9:BB:C8:DD:E7:FF	trish	20170504 0938 MDT	20200411 0000 MDT	MAC Registrations
🔍	Active	A9:BB:C7:D6:E5:F4	anna	20170504 0938 MDT	20200409 0000 MDT	MAC Registrations
🔍	Active	A1:B2:C3:D4:E5:F6	jack	20170504 0938 MDT	20200408 0000 MDT	MAC Registrations
🔍	Active	A7:B7:C8:D8:E9:F9	kevin	20170504 0938 MDT	20200407 0000 MDT	MAC Registrations
🔍	Active	A4:B4:C5:D5:E6:F6	pierce	20170504 0938 MDT	20200406 0000 MDT	MAC Registrations
🔍	Active	A1:B1:C2:D2:E3:F3	nate	20170504 0938 MDT	20200405 0000 MDT	MAC Registrations

At the bottom of the table, there is a pagination bar showing 'Results 1-8 of 8', a page number '15', and several icons for table actions.

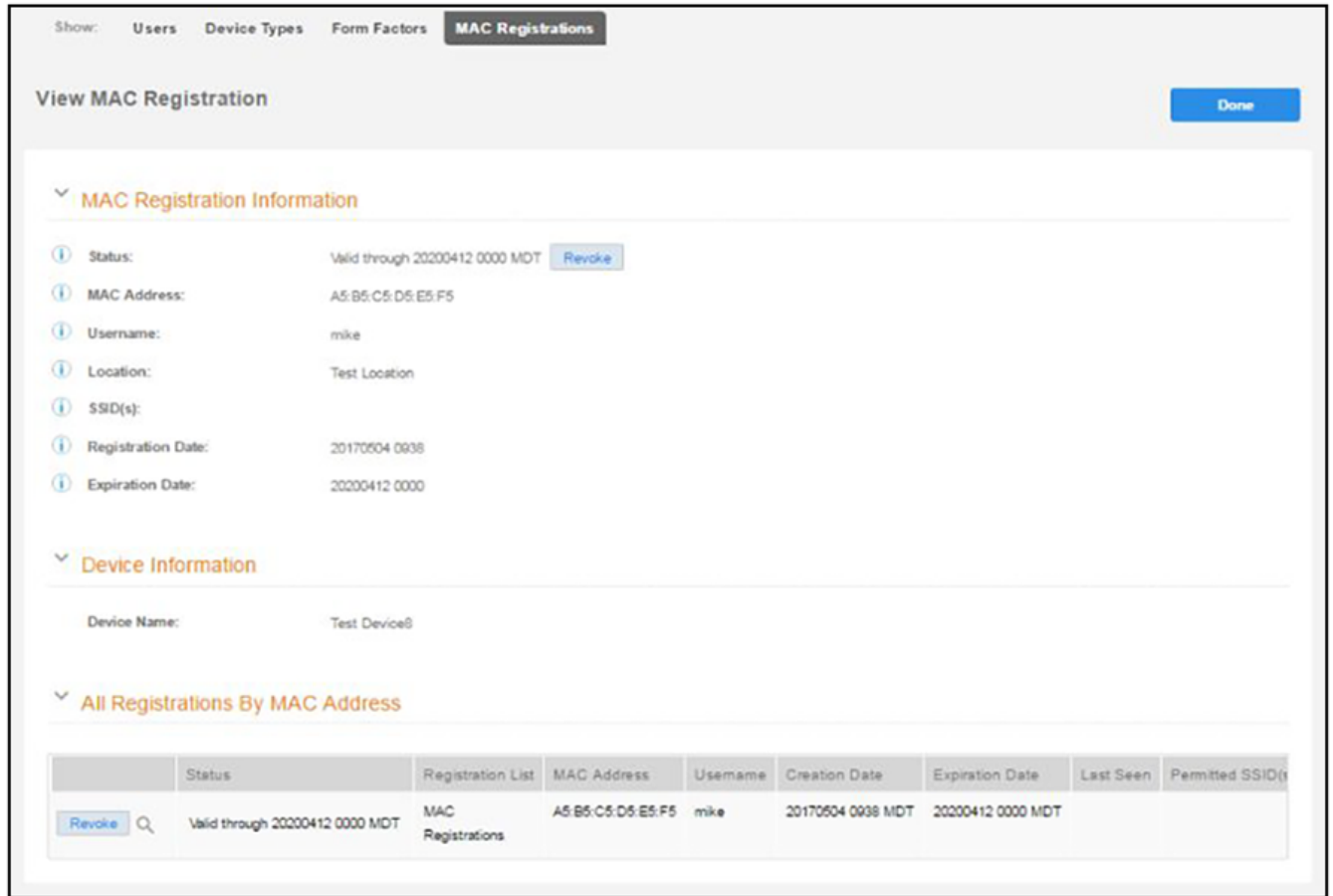
4. You can also access MAC registration information in the enrollment record. Go to **Operational > Dashboard > Enrollments > View Enrollment Record**.

### **How to Revoke Access for a MAC-Registered Device**

1. Go to **Dashboard > Users & Devices**, MAC Registrations tab.

2. Click the **View** icon to view the registration information for the device.

**FIGURE 33** View MAC Registration Details



3. In the **All Registrations by MAC Devices** section, click the **Revoke** button next to the device.
4. On the **Revoke** pop-up, list the reason for revocation and click **Revoke**. The MAC address for the device is removed from the list of accepted MAC addresses in the RADIUS server.

## Configuring a Cisco Controller for MAC Registration

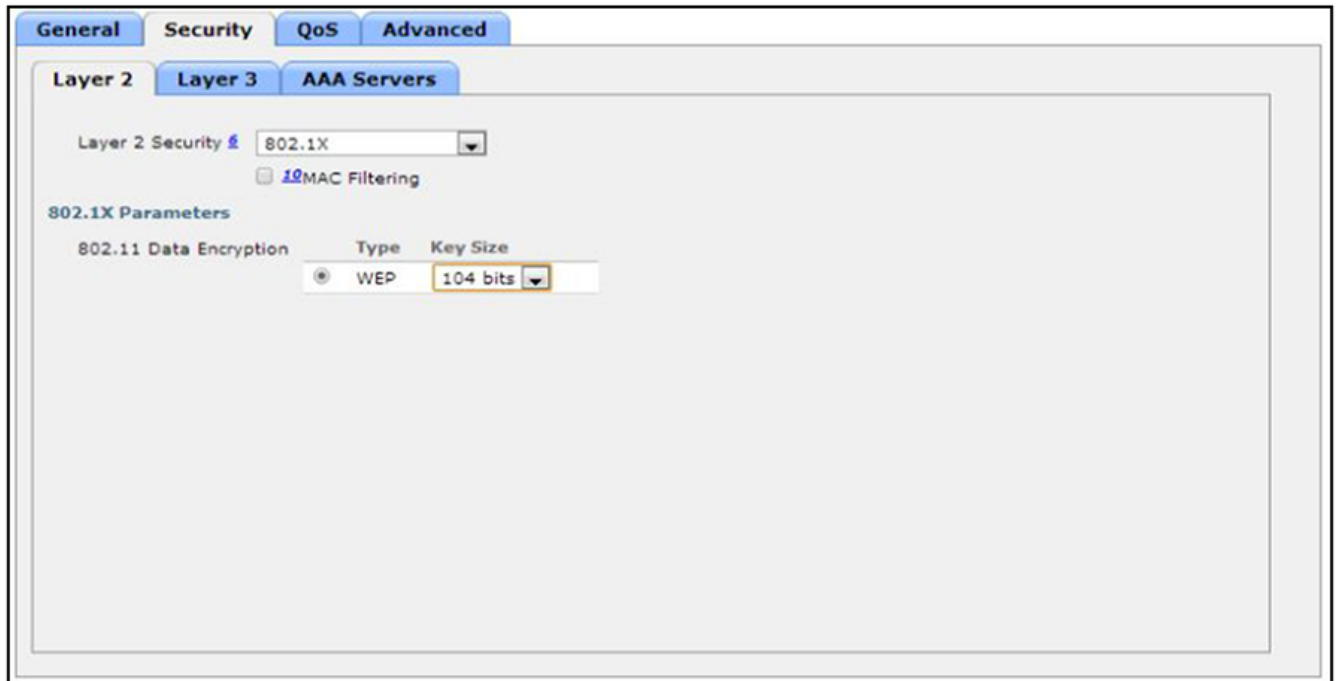
You must have a RADIUS server defined in the Cisco WLC. From the **WLANS > Edit** window, define the RADIUS server in the **Security > Radius Authentication** window and **Enable** the RADIUS server.

1. On the wireless controller, go to the **WLANS** tab and select the WLAN for MAC registration.
2. Select the **General** tab. In the **Interface/Interface Group** field, select the interface to which the WLAN is mapped.



3. Select **Security** > **Layer 2** tab.

**FIGURE 34** Layer 2 Security



4. In the **Layer 2 Security** section:
  - Select **NONE** for an open SSID.
  - Select **WPA+WPA2 +AuthKeyMgmt = PSK** for a PSK SSID.
5. Enable **Mac Filtering**. This enables MAC authentication for the WLAN.

**Layer 3 Settings:**

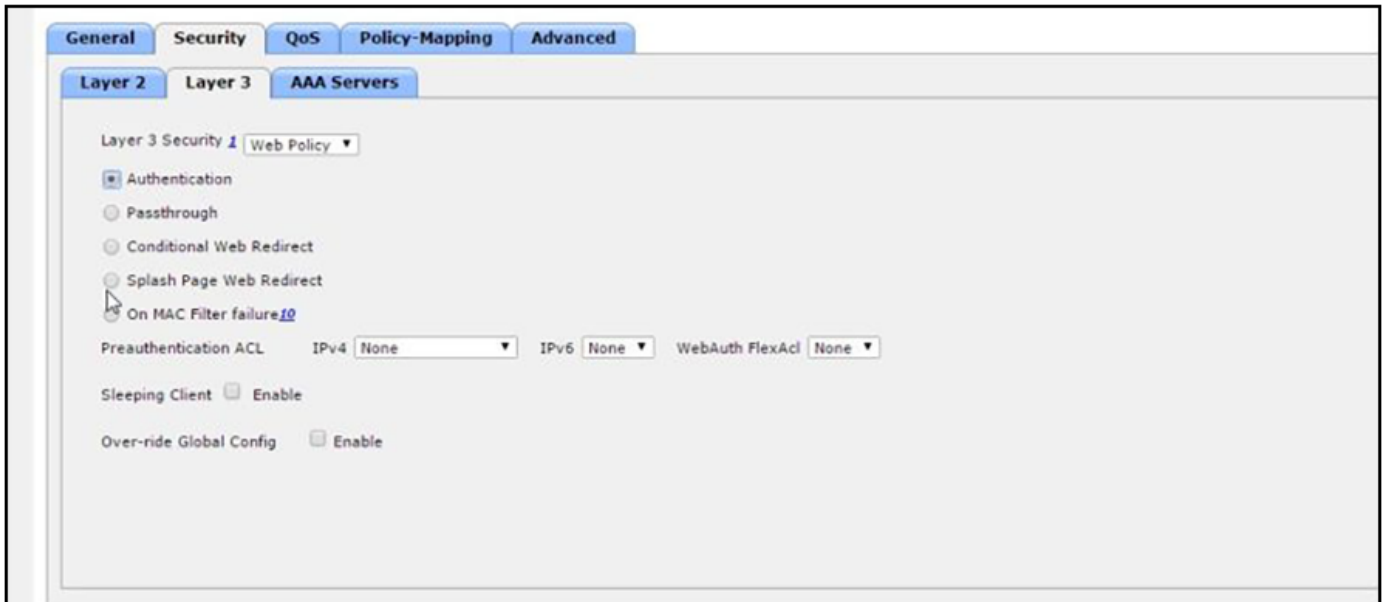
- Layer 2 Mac Filtering - Select to filter clients by MAC address. Locally configure clients by MAC address in the MAC Filters > New page. Otherwise, configure the clients on a RADIUS server.
- When using Layer 2 Mac Filtering: Web Policy - On MAC Filter failure - Enables web authentication MAC filter failures.

**FIGURE 35** Layer 3 Settings when Using Layer 2 Mac Filtering



- When NOT using Layer 2 Mac Filtering: Web Policy - Authentication - If you select this option, the user is prompted for username and password while connecting the client to the wireless network.

**FIGURE 36** Layer 3 Settings when Not Using Layer 2 Mac Filtering

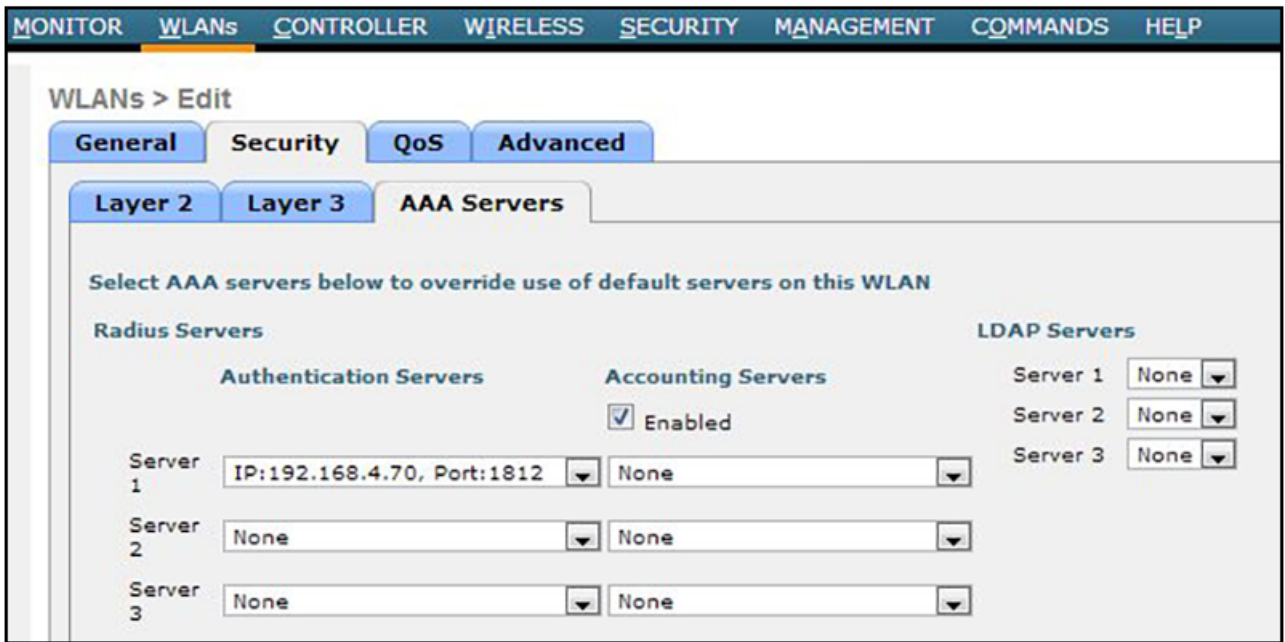


6. Select the **Security > AAA Servers** tab. In the **Authentication Servers** section, select the RADIUS server that will be used for MAC authentication.

**NOTE**

If you are using Cloudpath as a RADIUS server, define the ES RADIUS server in the Cisco WLC in the **Security > Radius Authentication** window.

**FIGURE 37** Select RADIUS Server



7. **Apply** changes.

The wireless controller is configured for MAC registration against the RADIUS server.



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